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ABSTRACT

This book provides practical advice on problems of institutional plant management to physical plant administrators. Areas covered include the role, organization, and facilities of the physical plant department; personnel administration; financial administration; buildings maintenance and operation; custodial services; utilities distribution systems; grounds maintenance; major repairs, renovations, and alterations; security and safety; physical planning, design, and construction; other functions. A bibliography is included. (MJM)

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A BASIC MANUAL FOR PHYSICAL PLANT ADMINISTRATION

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CONTENTS

INTRODUCTION,
THE PHYSICAL PLANT DEPARTMENT vii-xv
Role, Organization and Facilities

1. PERSONNEL ADMINISTRATION 1-32
2. FINANCIAL ADMINISTRATION 33-72
3. BUILDINGS MAINTENANCE AND OPERATION 73-128
4. CUSTODIAL SERVICES 129-200
5. UTILITIES DISTRIBUTIONS SYSTEMS 201-232
6. GROUNDS MAINTENANCE 233-286
7. MAJOR REPAIRS, RENOVATIONS AND ALTERATIONS 287-312
8. SECURITY AND SAFETY 313-372
9. PHYSICAL PLANNING, DESIGN AND CONSTRUCTION 373-432
10. OTHER FUNCTIONS 433-454

Bibliography 455-458

PREFACE

A product of many minds with a common purpose, the book that follows attempts to provide practical advice on problems of institutional plant management to physical plant administrators.

The publication began as a basic text for a Physical Plant Management Institute for Small and Black Institutions sponsored jointly by the National Association of College and University Business Officers and the Association of Physical Plant Administrators of Universities and Colleges. Original NACUBO funding came from a grant by the Education Professions Development Act Program of the U.S. Office of Education, Department of Health, Education and Welfare. Subsequent funding came from the governing boards of NACUBO and the APPA, which jointly underwrote the additional cost of revising, expanding and publishing the original instructional draft prepared for the management institute. Opinions expressed herein, however, represent those of the editors and do not necessarily reflect the policy of any sponsoring organization.

The result is more than a practical guide to assist physical plant administrators at universities and colleges. Since the manual treats comprehensively both the general principles and practical problems of physical plant administration, it should also prove a helpful text for administrators at all institutions with extensive physical facilities.

Since the text is an expansion of a preliminary instructional draft, numerous physical plant administrators contributed to the final result in ways too complex to document. No doubt many will find their ideas applied in these pages. Draft copies of each chapter were reviewed by the professional affairs committee of APPA, comprised of seven representatives, all of whom are experienced administrators. These professionals passed on the accuracy and content. Hopefully all who participated will also find their names listed in the acknowledgements that follow.

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INTRODUCTION

THE PHYSICAL PLANT DEPARTMENT:

ROLE, ORGANIZATION AND FACILITIES

The goal of this introduction is simple: to overview the book that follows and to explain the role of an educational physical plant department. The goal of the book is more complicated: to overview major problems facing physical plant administrators at small universities and colleges and to explore some solutions that have proved workable.

ROLE

The role of a physical plant department is the same for large or small schools--to help plan, create, maintain and operate an environment conducive to learning and research. Although this text is addressed primarily to administrators at small institutions with enrollments below 2,500, the solutions offered are applicable by extrapolation to larger institutions.

The importance of the physical plant mission is certainly the same at small and large institutions. Not only does an effective plant operation contribute to the educational process, but it also enhances the reputation of the institution. Educational reputations feed on two nutrients: the renown of faculty and campus appearance. Although the faculty are the mark of academic excellence, they can do little to improve the physical learning environment; an impressive physical plant, however, can help attract and retain good faculty.

In pursuit of this mission, most physical plant departments provide these essential programs: buildings maintenance and operation, custodial services, utilities distribution, grounds maintenance. Chapters on these topics, therefore, form the core of this book. All departments must cope with internal personnel and financial problems, and most must assist with a variety of other tasks such as planning new structures, renovating old ones, and providing safety and security programs. Chapters on these topics supplement the core. The result is not a set of universal panaceas, but a panoply of solutions that have proved workable and which appear adaptable to a variety of institutions.

PHYSICAL PLANT FUNCTIONS

The assortment of physical plant activities can be conveniently classified in terms of four major functions:

1. Planning. This function takes two forms: (1) long-range planning and (2) short-range planning. To assist long-range planning committees, the physical plant director serves as an information resource by providing technical data such as campus acreage, building areas, power needs and cost breakdowns. Although he plays a policy-serving rather than policy-making role, the data he provides can direct planning discussions into the most practical channels by showing the costs and effects of proposed programs on existing and planned facilities. Neither the director nor his data, however, should ever dictate policy.

   By serving on planning committees, the director also can prepare his department for major changes and expansions, thereby preventing crisis planning--an expensive and inefficient process.

   The second planning function involves short-range projects: the construction of new facilities and the renovation, remodeling and alteration of existing ones. Chapters 7 and 9 treat these topics in detail.

2. Operations. To keep buildings usable, physical plant personnel must keep functioning such diverse systems as elevators, air conditioning plants, fire alarm systems and electric generating plants.

3. Maintenance. To prevent unnecessary deterioration and repair the inevitable decay that buildings and their systems are heir to, the physical plant department must organize numerous basic maintenance tasks such as painting, inspecting, oiling and greasing. This function also includes a variety of small repair jobs necessary to maintain a building or its equipment for immediate use.

4. Service Functions. Cleaning buildings, removing snow, collecting trash, mowing lawns, controlling traffic, patrolling facilities are among numerous necessary services within the jurisdiction of the physical plant department.

ORGANIZATION

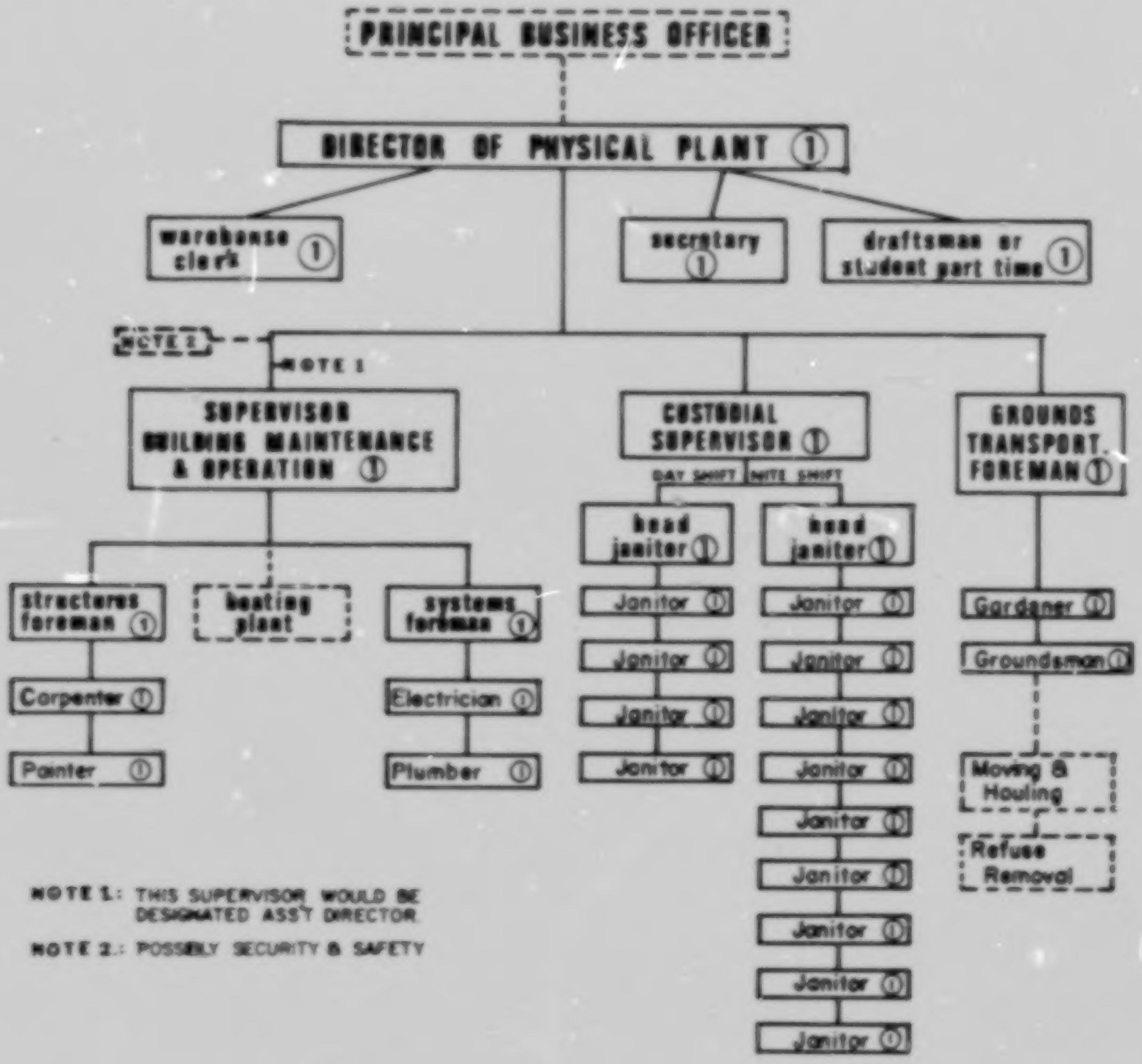
A physical plant department functions within a larger institutional structure that ties together all academic and administrative departments. The prevailing pattern on most campuses places the physical plant director under the chief business officer. Departments the physical plant group must work closely with are business, personnel and purchasing.

Logical physical plant department organization requires administrative components corresponding to the major work responsibilities of the department. The following charts show separate supervisors heading three major work groups--buildings maintenance and operation, custodial services, and grounds maintenance. Both charts place responsibility for utilities distribution systems under the supervisor for buildings maintenance and operation. The systems tradesmen in this group also would be capable of working on exterior piping and wiring systems.

SAMPLE ORGANIZATION OF PHYSICAL PLANT DEPARTMENT
Hypothetical case No. 1

Institution of 500 full time equivalent students	
Dormitories with 400 bed capacity	110,000gsf.
Academic administrative & general support bldgs.	130,000gsf.
TOTAL :	240,000gsf.

Employees for Admin., Bldg. M&O., Grounds & Custodial 24 to 30

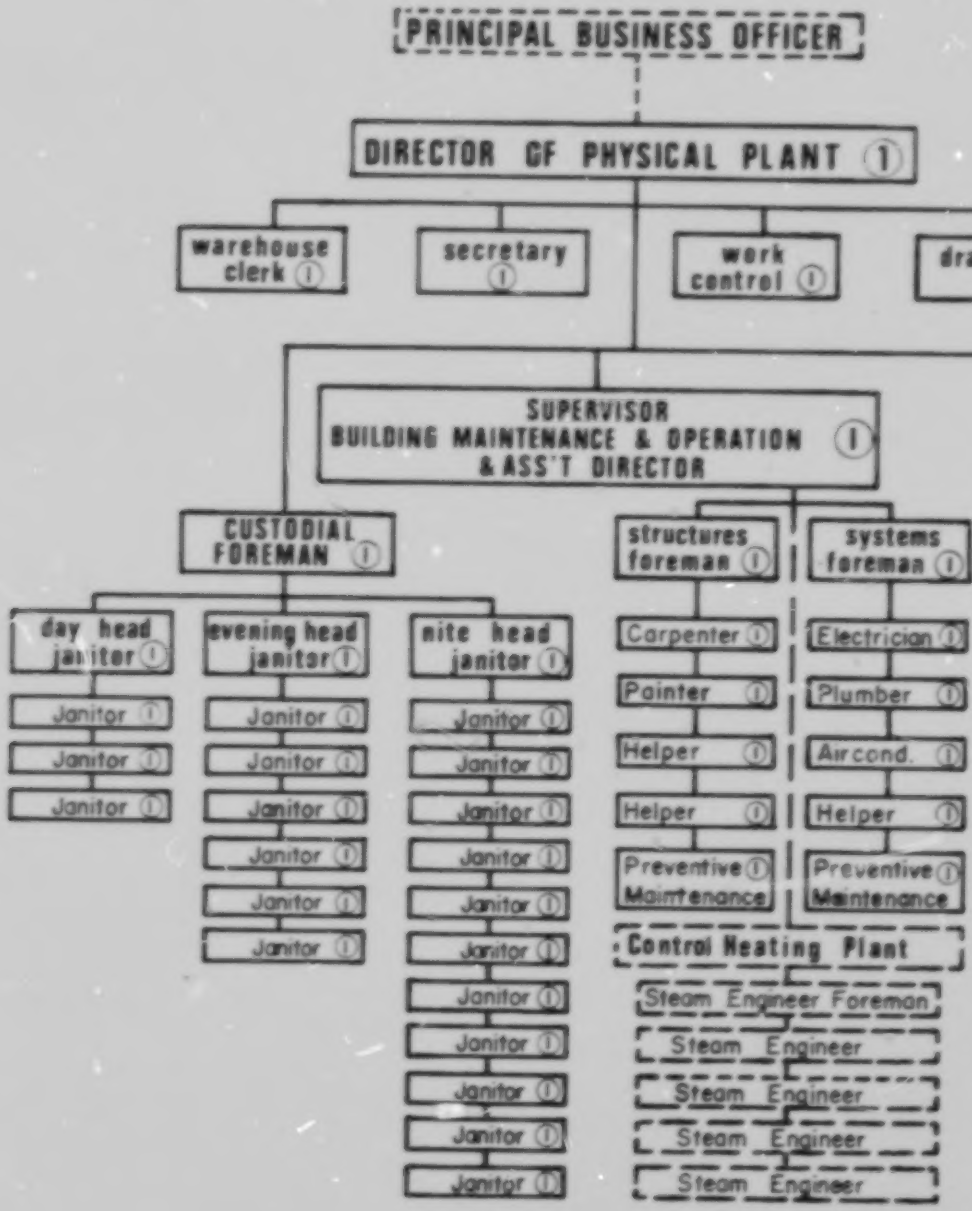

PRINCIPAL BUSINESS OFFICER
DIRECTOR OF PHYSICAL PLANT ①
warehouse clerk ①
secretary ①
draftsman or student part time ①
NOTE 2
NOTE 1
SUPERVISOR BUILDING MAINTENANCE & OPERATION ①
CUSTODIAL SUPERVISOR ①
DAY SHIFT
NITE SHIFT
GROUNDS TRANSPORT. FOREMAN ①
structures foreman ①
heating plant
systems foreman ①
Carpenter ①
Painter ①
Electrician ①
Plumber ①
head janitor ①
head janitor ①
Janitor ①
Janitor ①
Janitor ①
Janitor ①
Janitor ①
Janitor ①
Janitor ①
Janitor ①
Janitor ①
Janitor ①
Janitor ①
Janitor ①
Janitor ①
Gardener ①
Groundsman ①
Moving & Hauling
Refuse Removal

NOTE 1: THIS SUPERVISOR WOULD BE DESIGNATED ASS'T DIRECTOR.

NOTE 2: POSSIBLY SECURITY & SAFETY

SAMPLE ORGANIZATION OF PHYSICAL PLANT DEPARTMENT
Hypothetical case No. 2

Institution of 2000 full time equivalent students
Day school only - no dormitories 100% commuting.
Academic, administrative & general support bldgs. 400,000 gsf.
Employees for Admin., Bldg. M.&O., Grounds & Custodial 40 to 50


PRINCIPAL BUSINESS OFFICER
DIRECTOR OF PHYSICAL PLANT ①
warehouse clerk ①
secretary ①
work control ①
draftsman ①
SUPERVISOR BUILDING MAINTENANCE & OPERATION & ASS'T DIRECTOR ①
CUSTODIAL FOREMAN ①
structures foreman ①
systems foreman ①
GROUNDS FOREMAN ①
day head janitor ①
evening head janitor ①
nite head janitor ①
Janitor ①
Carpenter ①
Painter ①
Helper ①
Preventive Maintenance ①
Electrician ①
Plumber ①
Aircond. ①
Gardener ①
Groundsman ①
Labor ①
Central Heating Plant
Steam Engineer Foreman
Steam Engineer

Supervisors for these three work groups report directly to the physical plant director, as do secretaries, warehouse clerks and work control clerks--personnel responsible for the department's administrative work.

The key to successful administration, however, is not the organizational structure, but the people who staff it. Thus, the person most responsible for the success of a physical plant operation is the director. Since he employs and supervises many personnel working at many tasks, he carries status and responsibility comparable to an academic dean. In small schools he may also carry secondary responsibility for one or more parallel tasks such as stores, purchasing, student housing and perhaps even teaching.

His major role is twofold: (1) to serve as a resource for the whole institution by making accessible the talents and data of his department; and (2) to translate the institution's goals into action by organizing programs to achieve them.

Given the varied nature of his work, it is difficult to identify the perfect prerequisites for the position. An APPA survey shows that preparation in engineering and business appear most frequently in the educational background of successful physical plant directors. Capable directors also have come from related fields such as architecture, landscape architecture, pedagogy and mathematics. Perhaps more important than formal training is broad applicable experience in the field.

Equally pertinent is character. The ideal personality profile for a physical plant director would highlight the ability to communicate effectively, to organize problem-solving responses quickly, and to recognize his own limitations. A communicative talent is important because the director must constantly keep in touch with diverse groups which might include theoretical chemists, students, administrators, architects, supervisors, secretaries, contractors and tradesmen. If he cannot understand these collaborators and translate their problems into comprehensible terms, he cannot do the director's job.

Responding to problems requires organizational aptitude, an ability to analyze a task into its essential segments and delegate to capable personnel responsibility for them. Essential to delegating work is the ability to recognize his own and his department's limitations.

The director is supposed to be a manager of men, one who works by conceptualizing assignments and finding capable people to accomplish them. Responding to problems beyond the scope of the talent available indicates poor judgment and usually results in financial disaster.

PHYSICAL PLANT DEPARTMENT

FACILITIES

Although seldom mentioned in job descriptions of a physical plant director, providing adequate facilities, tools and equipment is one primary duty, a duty too important to delegate to a subordinate. Specific recommendations about particular facilities are offered in the pertinent chapters. Offered here are five general recommendations:

1. Request first-rate facilities. Adequate facilities exert a direct influence on the morale of physical plant employees and the image of the institution they serve. The image of an institution springs from many factors, not least of which are the physical appearance of its plant and the personal attitudes of its employees. Good working conditions inspire more professional attitudes among plant personnel, attitudes which pay off in cleaner, more efficient facilities and in friendlier, more courteous relations with students, faculty and visitors.

2. Locate the physical plant facility on the periphery of the campus. Economic considerations call for combining physical plant shops with the heating plant and locating both structures near the center of campus to reduce piping costs and personnel travel time. Educational considerations, however, call for organizing the center of the campus around a library or student union. Economic efficiency, however, should always stand secondary to the institution's educational mission.

   Aesthetic considerations also call for siting shops, smokestacks and coal piles on the fringes of campus.

3. Design flexibility for future expansion. To estimate the ultimate student enrollment and campus land area, consult the campus comprehensive development plan. If none exists, ask administrators for estimates and adjust them upwards for leeway.

To provide for present and future physical plant needs, start with a single-story structure located on the campus periphery. The advantages of a one-floor building for housing storerooms, heavy shop tools and garage equipment is obvious. In a 1968 survey over 70% of the physical plant administrators polled preferred a single-story facility to a multistory building.

Planning for expansion requires provision for a smooth transition from a single, all-purpose shop to a combination of more specialized work areas. The drawing on the next page shows a linear schematic for a basic rectangular work area totaling 12,000 square feet. As the department expands, separate wings of 6,000 square feet can be added in sequence to provide more work room and for an efficient U-shaped layout. In addition, the original core building can be designed for a second story to house administrative and supervisory offices.

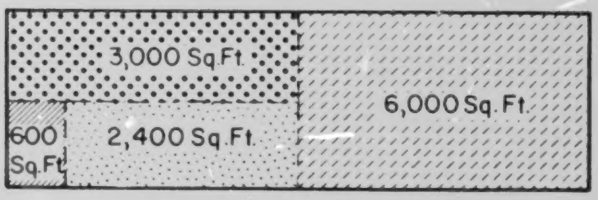
4. Insist upon competent professional designers. Although obvious, the advantages of this tactic should never be underestimated. Chapter 9, Physical Planning, Design and Development, offers some specific suggestions on choosing architects and engineers and reviewing their work.

5. To gain insight visit similar facilities on other campuses and on industrial sites. This suggestion was one of the most frequently volunteered comments in the 1968 poll mentioned earlier.

Although devising logical administrative organizations and obtaining adequate physical plant facilities are the first tasks a physical plant director must accomplish, managing men and money are probably the most difficult. Chapters 1 and 2, therefore, begin by examining these management problems.

SUGGESTED SPACE ALLOCATIONS FOR PHYSICAL PLANT DEPARTMENT BUILDING

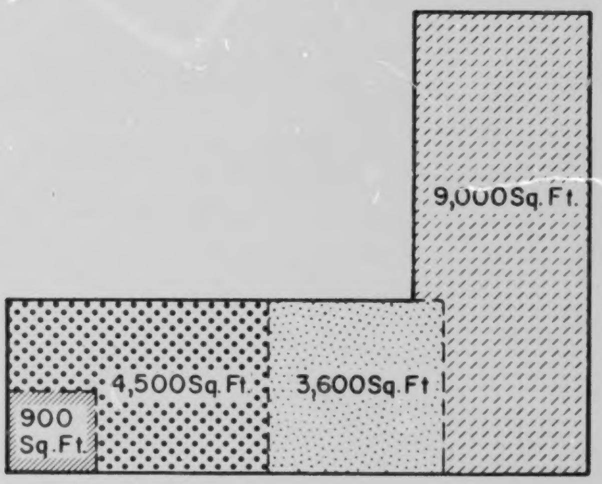
PHASE 1.


3,000 Sq. Ft.
600 Sq. Ft.
2,400 Sq. Ft.
6,000 Sq. Ft.

SUBDIVISION OF SPACE
12,000 Gross Sq. Ft.
35 EMPLOYEES

5% Admin.
50% Build. M.& O. Shops
20% Custodial
25% Grounds

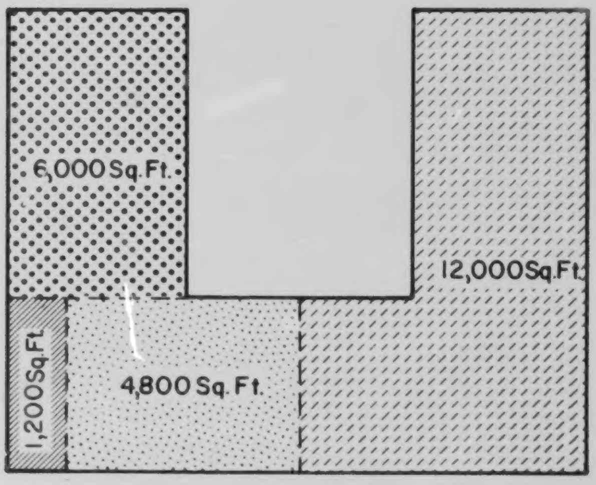
PHASE 2.


9,000 Sq. Ft.
4,500 Sq. Ft.
3,600 Sq. Ft.
900 Sq. Ft.

18,000 Gross Sq. Ft.
45-EMPLOYEES

5% Admin.
50% Build. M.& O. Shops
20% Custodial
25% Grounds

PHASE 3.


6,000 Sq. Ft.
12,000 Sq. Ft.
1,200 Sq. Ft.
4,800 Sq. Ft.

24,000 Gross Sq. Ft.
64-EMPLOYEES

5% Admin.
50% Build. M. & O. Shops
20% Custodial
25% Grounds

▨ 5% ▧ 50% ░ 20% ▒ 25%

1

PERSONNEL ADMINISTRATION

INTRODUCTION.. 1-3

RESPONSIBILITIES OF THE PERSONNEL OFFICE.................. 4-6

RESPONSIBILITIES OF THE PHYSICAL PLANT OFFICE............. 6-32

Figure 1-1: Job Description Form
Figure 1-2: Schedule for Job Classification Study
Figure 1-3: Job Description for Carpenter
Figure 1-4: Job Description for Groundsman
Figure 1-5: Job Description for Clerical Worker
Figure 1-6: Sample Application for Employment
Figure 1-7: Sample Payroll and Leave Card
Figure 1-8: Checklist for New Employee Orientation

1

PERSONNEL ADMINISTRATION

LATER CHAPTERS SUGGEST how a physical plant director can acquire expertise in fields as diverse as business procedures, money management and various technical disciplines. The first chapter, however, should suggest how to become at least a part-time expert in personnel administration--the systematic approach to recruiting, allocating, utilizing, and developing man and womanpower.

Personnel administration comes first for several reasons. A physical plant director, despite his title, directs people. He spends nearly two-thirds of his budget on their salaries and wages and at least one-third of his time on their problems.

The personnel administration chapter, like those that follow cannot, by itself, cover the field. What it can do is offer practical advice on how the physical plant director can deal with some more troublesome aspects of personnel administration. Consider these offerings not as commandments but as suggestions, each of which must be adapted to the unique conditions on each campus. None of us should play Moses, especially when it comes to managing men.

RESPONSIBILITIES
OF THE
PERSONNEL OFFICE

When he needs help, and he will need it, the physical plant director turns to the institution's personnel office. Because effective personnel administration contributes so significantly to the successful operation of an educational institution, most large schools maintain a separate personnel office. In small schools this responsibility usually falls to the chief officer in charge of business.

The general goal for all personnel offices is the same--to develop and coordinate campus policies and procedures for governing relationships between the institution and its employees. Its specific responsibilities include:

1. Recruiting and screening applicants
2. Training and supervising employees
3. Establishing and overseeing an equal opportunity program
4. Developing a job classification system
5. Developing salary and wage plans
6. Maintaining complete personnel records for all professional, technical, clerical, and service personnel
7. Administering a benefits program
8. Managing labor relations

In general, the personnel office because of its professional expertise serves as resource for all departments in employee relationships.

Chapter 1

PERSONNEL ADMINISTRATION

Responsibilities of the Personnel Office

The most familiar function served by the personnel office is recruiting and screening. This office advertises vacancies in appropriate newspapers and journals and notifies employment agencies and special organizations like the Higher Education Administrative Referral Service. Since the personnel office is logically the first stop for the job applicant, it must maintain a complete and current list of all open positions.

When applicants appear, a personnel officer does the initial interviewing, information recording, and any preliminary testing required. In cases where numerous candidates apply, the personnel office winnows the list to a select number of qualified personnel and refers them to the appropriate department for detailed interviewing and final selection. The personnel office never has the final word on hiring, nor does it exercise any line authority over the employees in other departments.

One of the most important functions a personnel office performs is developing written statements of institutional policy on all areas of employer-employee relationships. The office should establish and publish in a handbook policy statements on most, if not all, of the following topics:

- Awards, incentive & service
- Coffee breaks
- Conduct
- Credit union
- Development
- Disability retirement
- Disciplinary action
  - Causes, Separation, Suspension
- Dismissals
- Discrimination
- Educational benefits
- Efficienty ratings
- Equal employment opportunity
- Flower fund
- Gift fund
- Grade scale
- Grievances & appeals
- Indoctrination
- In-service training
- Insurance
  - Medical & Hospitalization
  - Social Security
  - Workmen's Compensation
- Labor relations
- Leave
  - Annual, Court, Death in family, Emergency, Funeral, Jury duty, Maternity, Military, Personal, Vacation, Voting, Weather, With pay, Without pay
- Legislative requirements
  - Employee, Employer
- Lunchtime
- Medical benefits
- Night differential
- Nondiscrimination
- Organization membership
- Outside employment
- Overtime
- Overtime pay
- Parties & picnics
- Pay periods
- Pay plan
- Privileges to use facilities
- Probation
- Promotion

- Reclassification
- Recreational benefits
- Recruitment
- Regular time
- Resignation
- Rest periods
- Retirement
- Retirement system
- Salary scale
- Self-improvement
- Seniority
- Separation
- Severance pay
- Shift differential
- Supervisor/Supervised relations
- Suspension
- Training
- Unemployment compensation
- Wage attachments
- Wage garnishments
- Work schedule
  - Irregular, Regular, Standby

This document spells out the rights and obligations, rewards and punishments--basic groundrules that everyone must use when working on campus. Since everyone--administrators, faculty, supervisors and employees--consults the personnel manual to resolve questions and uncertainties, all policy statements should be as clear and comprehensive as possible. Ambiguities and gaps eventually cause confusion, contention and legalistic delays when disputes arise.

RESPONSIBILITIES
OF THE
PHYSICAL PLANT OFFICE

All assistance by the personnel office still leaves a heavy load of personnel work that the physical plant department must carry by itself. In part, this work consists of processing many administrative records that any large employer must handle. In addition, however, the physical plant department deals with numerous special management problems that stem from the unique work conditions found in physical plant workplaces.

RECORD KEEPING

The first chore is record keeping. In fact, personnel administration once involved record keeping and nothing else. Even today this task is so essential to effective management that many physical plant offices compile records duplicating to some extent those in the institution's personnel office. From this redundancy comes two benefits. First, the employee can find whatever information he needs in his home office, a benefit that helps develop a sense of departmental identity and loyalty. Secondly, the physical plant director who keeps fairly complete records on hand retains management authority that otherwise might fall by default to another office.

Staff

At small schools it is the director and his secretary who handle these personnel records as part of their normal work. As the number of physical plant employees increases, however, personnel responsibilities grow into a full-time job for one person.

Job Descriptions

Two closely related records are job descriptions and job classifications. Job descriptions spell out the education, experience and duties each position requires and the salary it pays. See Figure 1-1. The job classification groups the position with similar jobs in the same basic salary range. See Figure 1-2. Descriptions come primarily from the physical plant office, classifications from the institutions personnel office.

A job description outlines the type and level of work, the hours, duties, decision-making responsibilities, reporting responsibilities, and accountability that the job entails; as well as the training and education it requires. Since job descriptions cannot detail every task to be performed, it should include a statement to the effect that the employee "may perform other tasks as assigned."

In devising job descriptions, the physical plant director should consult a variety of people, including employees now holding the positions, their supervisors, job description writers, personnel administrators, and other physical plant directors. From this data, the director or one of his subordinates can outline a basic worksheet and send it to supervisors, employees and personnel officers for review and revision prior to final publication. Sample job descriptions are shown in Figures 1-3, 1-4 and 1-5.

Since work conditions change with time, job descriptions should be reviewed periodically and revised when necessary. The best procedure for the director is to go back to the people who helped him devise the original, especially the employee. Since the employee may now be performing different tasks entirely and carrying more responsibility, he should be given the original job description and asked to specify how his work has changed. To arrive at accurate revisions, the director should interview carefully those workers who have trouble expressing themselves in writing. This revision process can be coupled with an annual or biannual employee evaluation and perhaps can result in reclassification of the job or an upgrading of the employee.

Job Classification

As the term suggests, a job classification groups a position with similar jobs paying comparable salaries. It shows the employee the salary range for his position--starting salary and increases he can hope to earn by satisfactory performance. When employees are unionized, the classification lists wage levels in the union contract. It also shows the employee other positions he may wish to strive for.

To provide the employee with essential job information concisely, the director might work both the job description and job classification on opposite sides of one card.

Vacancies

Although a list of all job vacancies is always posted in the central personnel office, another should be displayed in the physical plant office. Often physical plant employees see the notices and suggest that qualified people apply. For these open positions, the person responsible for personnel information in the physical plant office should maintain an updated file of pertinent job descriptions and classifications.

Employee Records

For each of its employees, the physical plant department should have on hand a personal information file, a jacket with a basic data sheet, photograph, fingerprints, payroll cards, attendance records, and separation papers.

Figure 2-1.

____________________ UNIVERSITY/COLLEGE

POSITION TITLE ____________

POSITION DESCRIPTION

QUALIFICATIONS REQUIRED OF INCUMBENT:

Education:
  Level ____________
  Specializations ____________
  Trade Schools ____________
  Apprenticeship ____________
  Licenses ____________
Experience:
  Years
  In what specialty? ____________
  ____
  What level of responsibility?
  ____

This is a proposal for
☐ New Position
☐ Reclassification:

Incumbent ____________
____
Current Study
Number ____________

College, School,
Division ____________

Department ____________
Fund & Budget ____________

DEFINITION OF POSITION:

SPECIFIC SKILLS REQUIRED:

RESPONSIBILITY:
  Supervision of the following
  classes ____________
  ____
  ____

Employee	Independently	After consultation
Assigns duties	☐	☐
Reviews work	☐	☐
Disciplines	☐	☐
Makes rules	☐	☐
Adjusts rules	☐	☐

Is supervised by (title) ____________
Has a maximum amount of $________ (money) in his possession at any one time.
Is responsible for the following items of equipment or property:

DESCRIPTION OF THE DUTIES: On the back of this sheet, describe concisely this position. Use the following headings and numbers.

1. TASKS REQUIRED IN A USUAL WEEK (Indicate the approximate hours per week required for each task.)
2. UNUSUAL TASKS (List tasks which are performed monthly or less frequently; indicate the frequency.)
3. DISAGREEABLE OR HAZARDOUS DUTIES (Explain possible danger to the incumbent.)
4. MOST DIFFICULT TASK
5. MOST TIME-CONSUMING TASK
6. MOST RESPONSIBLE TASK

SIGNATURES: Incumbent (if any) ____________
Immediate Supervisor ____________
Department Head ____________

SCHEDULE FOR JOB CLASSIFICATION STUDY WHERE NONE EXISTS

1. Send a general letter to all department heads describing the objectives of the study and inviting them to a group meeting.
2. Hold a group meeting describing the procedures to be followed.
3. Send a general letter to employees describing the objectives of the study and the procedure to be followed.
4. Prepare instructions and questionnaires for distribution.
5. Provide each deaprtment head with enough questionnaires to give one to each employee. (Large numbers of very similar positions may be covered by one questionnaire.)
6. Hold meetings in the departments to explain to employees what they are expected to do and how to go about it.
7. The President's or administrator's office will advise department heads that all questionnaires are to be completed, including supervisor's comment, and returned to the Personnel Office by a specified date.
8. Personnel Office will check to be sure a questionnaire has been returned for each employee or employee group.
9. Personnel Office (and/or consultants) will sort questionnaires by payroll title, and by level of work within job classes.
10. Personnel Office (and/or consultants) will study questionnaires and conduct follow-up interviews where necessary.
11. Personnel Office (and/or consultants) will write a class specification for each job class.
12. Personnel Office (and/or consultants) will recommend allocation of each position to an appropriate job class. (Job Evaluation)
13. Department heads will be notified of allocation of positions to a class and an appeal period will be provided.
14. Personnel Office (and/or consultants) will recommend a classification plan and a pay plan including pay grades and salary ranges, or a single rate of pay.
15. The Personnel Office (and/or consultants) will collect such wage surveys as may have been done recently in the community and in agencies of similar size and organization. If the survey data is inadequate, the Personnel Office (and/or consultants) may make a wage survey.
16. The Personnel Office (and/or consultants) will recommend the allocation of job classes to pay grades and salary ranges.
17. The completed classification and pay plan will be recommended to the administration and the governing board.

Figure 1-2.

Application Form. The basic document is the job application form; it provides information such as name, social security number, local address, birthdate, marital status, education, previous work experience, military service, job title, date of employment, and salary. Figure 1-6 is one example of such a form. In devising application blanks, administrators must consider state and federal laws prohibiting specification of race and sex.

Photographs and Fingerprints. After employment, supplement the application form with a photograph and a set of fingerprints. Both items, however, are controversial; the first because of fears about racial discrimination, the second because of police records. Fingerprinting, however, can discourage omissions and falsifications of previous police records; it can also protect employees from unwarranted suspicion in the event of thefts. Many schools participate in rehabilitation programs by hiring people with previous police records. Few schools, however, tolerate deliberate concealment of such information.

Performance Memos. One of the most important uses for the employee file is to serve as a repository for memos of commendation and criticism. The awareness that special efforts and deficient performance are recorded in writing can be an incentive to better work.

Payroll Card. A payroll card with a complete financial account of the individual's stay at the institution is a service to the employee. The essential data on such a form are: date of employment, original job title, starting salary, increases earned, reclassifications, and present salary. From such a card, the secretary or personnel clerk can quickly answer most questions an employee might ask. Figure 1-7 is an example of such a card which is kept for each fiscal year.

Figure 1-3.

________________ UNIVERSITY/COLLEGE

POSITION TITLE CARPENTER

POSITION DESCRIPTION

QUALIFICATIONS REQUIRED OF INCUMBENT:

Education:

Level 6th grade minimum

Specializations ________

Trade Schools ________

Apprenticeship ________

Licenses ________

Experience:

Years 4 years full-time

In what specialty? Carpentry

What level of responsibility? Skilled in construction of wooden structures

This is a proposal for

( ) New Position

( ) Reclassification:

Incumbent JOHN DOE

Current Study Number ________

College, School, Division ________

Department Physical Plant

Fund & Budget 400-822

DEFINITION OF POSITION:

SPECIFIC SKILLS REQUIRED:

RESPONSIBILITY:

Supervision of the following classes Lower level maintenance personnel, assistants and helpers.

Employee	Independently	After consultation
Assigns duties	( )	( )
Reviews work	( )	( )
Disciplines	( )	( )
Makes rules	( )	( )
Adjusts rules	( )	( )

Is supervised by (title) Carpenter-Foreman

Has a maximum amount of $________ (money) in his possession at any one time.

Is responsible for the following items of equipment or property:

DESCRIPTION OF THE DUTIES: On the back of this sheet, describe concisely this position. Use the following headings and numbers.

1. TASKS REQUIRED IN A USUAL WEEK (Indicate the approximate hours per week required for each task.)
2. UNUSUAL TASKS (List tasks which are performed monthly or less frequently; indicate the frequency.)
3. DISAGREEABLE OR HAZARDOUS DUTIES (Explain possible danger to the incumbent.)
4. MOST DIFFICULT TASK
5. MOST TIME-CONSUMING TASK
6. MOST RESPONSIBLE TASK

SIGNATURES: Incumbent (if any) ________

Immediate Supervisor ________

Department Head ________

Reverse side Figure 1-3.

1. *TASKS REQUIRED IN A USUAL WEEK:*
   Erecting partition and scaffolding
   Repairing chairs, tables, desks, shelves, cabinets, cupboards
   Installing locks
   Installing glass
   Cleaning and maintaining tools and equipment

2. *UNUSUAL TASKS:*
   Laying floors, installing baseboards and moldings
   Building stairs, fences
   Repairing shingle roofs
   Installing acoustical ceiling tile

3. *DISAGREEABLE OR HAZARDOUS DUTIES:*
   High work, i.e., roof repair

4. *MOST DIFFICULT TASK:*
   Cabinetmaking

5. *MOST TIME-CONSUMING TASK:*
   Cabinetmaking

6. *MOST RESPONSIBLE TASK:*
   Any carpentry task requiring completion by a deadline

Figure 1-4.

__________________________________ UNIVERSITY/COLLEGE

POSITION TITLE GROUNDSMAN

POSITION DESCRIPTION

QUALIFICATIONS REQUIRED OF INCUMBENT:

Education:

Level 8th grade
Specializations __________
Trade Schools __________
Apprenticeship __________
Licenses __________

Experience:

Years
In what specialty? None, can be trained
What level of responsibility? __________

This is a proposal for
( ) New Position
( ) Reclassification:

Incumbent __________
Current Study Number __________
College, School, Division Physical Plant
Department Grounds/Transportation
Fund & Budget 400-822

DEFINITION OF POSITION:

Helps with maintenance of campus grounds and roads.

SPECIFIC SKILLS REQUIRED: Manual dexterity in use of tractors, lawnmowers, sprayers, fertilizers, pruners, etc.

RESPONSIBILITY:

Supervision of the following classes none

Employee	Independently	After consultation
Assigns duties	( )	( )
Reviews work	( )	( )
Disciplines	( )	( )
Makes rules	( )	( )
Adjusts rules	( )	( )

Is supervised by (title) Grounds-Transportation Foreman
Has a maximum amount of $__________ (money) in his possession at any one time.
Is responsible for the following items of equipment or property:

DESCRIPTION OF THE DUTIES: On the back of this sheet, describe concisely this position. Use the following headings and numbers.

1. TASKS REQUIRED IN A USUAL WEEK (Indicate the approximate hours per week required for each task.)
2. UNUSUAL TASKS (List tasks which are performed monthly or less frequently; indicate the frequency.)
3. DISAGREEABLE OR HAZARDOUS DUTIES (Explain possible danger to the incumbent.)
4. MOST DIFFICULT TASK
5. MOST TIME-CONSUMING TASK
6. MOST RESPONSIBLE TASK

SIGNATURES: Incumbent (if any) __________
Immediate Supervisor __________
Department Head __________

Reverse side Figure 1-4.

1. TASKS REQUIRED IN A USUAL WEEK:

   Picks up paper leaves and trash
   Assists in pruning, grading, laying sod, spraying, cutting grass, fertilizing
   Transplants shrubs and assists in tree surgery
   Helps set up stage for various campus functions

2. UNUSUAL TASKS:

   Helps make and repair paths on campus
   Removes snow and sands roads and paths in winter
   Helps repair parking lots
   Helps make minor repairs on grounds equipment

3. DISAGREEABLE OR HAZARDOUS DUTIES:

   Use of certain grounds equipment - high speed
   Pruning large trees

4. MOST DIFFICULT TASKS:

   Properly laying sod
   Tree surgery

5. MOST RESPONSIBLE TASK:

   Grounds care in high-intensity areas

Figure 1-5.

______________________________ UNIVERSITY/COLLEGE

POSITION TITLE CLERICAL WORKER

POSITION DESCRIPTION

QUALIFICATIONS REQUIRED OF INCUMBENT:

Education:

Level High school diploma

Specializations Commercial

Trade Schools ____________

Apprenticeship ____________

Licenses ____________

Experience:

Years

In what specialty? Typing and ability to follow directions

What level of responsibility?

____

This is a proposal for

( ) New Position

( ) Reclassification:

Incumbent ____________

____

Current Study Number ____________

College, School, Division Physical Plant

Department ____________

Fund & Budget ____________

DEFINITION OF POSITION: General typing and clerical tasks which require speed, accuracy and the exercise of independent judgment and initiative

SPECIFIC SKILLS REQUIRED: 45 words per minute typing speed on any standard typewriter, with acceptable accuracy; familiarity with typing of stencils, forms, reports, business correspondence.

RESPONSIBILITY:

Supervision of the following classes ____________

____

____

Employee	Independently	After consultation
Assigns duties	( )	( )
Reviews work	( )	( )
Disciplines	( )	( )
Makes rules	( )	( )
Adjusts rules	( )	( )

Is supervised by (title) Physical Plant Secretary

Has a maximum amount of $__________ (money) in his possession at any one time.

Is responsible for the following items of equipment or property:

DESCRIPTION OF THE DUTIES: On the back of this sheet, describe concisely this position. Use the following headings and numbers.

1. TASKS REQUIRED IN A USUAL WEEK (Indicate the approximate hours per week required for each task.)
2. UNUSUAL TASKS (List tasks which are performed monthly or less frequently; indicate the frequency.)
3. DISAGREEABLE OR HAZARDOUS DUTIES (Explain possible danger to the incumbent.)
4. MOST DIFFICULT TASK
5. MOST TIME-CONSUMING TASK
6. MOST RESPONSIBLE TASK

SIGNATURES: Incumbent (if any) ____________

Immediate Supervisor ____________

Department Head ____________

Reverse side Figure 1-5.

1. TASKS REQUIRED IN A USUAL WEEK:
   Typing correspondence, reports, contracts, memoranda
   Operating office equipment as recording equipment, calculators, telephones, Xerox, mimeograph
   General filing of physical plant material

2. UNUSUAL TASKS:
   Composing business correspondence for approval of supervisor
   Receptionist duties

3. DISAGREEABLE OR HAZARDOUS TASKS:
   None

4. MOST DIFFICULT TASKS:
   High production, maximum accuracy jobs

5. MOST TIME-CONSUMING TAS.
   Specification typing

6. MOST RESPONSIBLE TASK:
   Filing accurately

Figure 1-6.

APPLICATION
for employment with
THE UNIVERSITY OF ____________________

PERSONAL DATA
Name .... Social Security Number .... Date ....
Address .... City .... State .... Zip Code ....
Age .... Birth Date .... Sex .... Marital Status .... Telephone ....
Height .... Weight .... Number of Children and Ages ....
Describe any physical disability ....

Position Desired .... How referred to the University? ....

EDUCATION
Circle highest year completed: High School 9 10 11 12 College 1 2 3 4 Graduate 1 2 3 4
Name of College .... Major .... Degree Awarded and Date ....
Other Education and Training ....

EMPLOYMENT RECORD Please complete in detail, starting with present employer and explain any lapse of time not accounted for. Attach resume, or listing of additional positions if necessary.

1	EMPLOYER ADDRESS YOUR TITLE NAME & TITLE OF SUPERVISOR REASON FOR LEAVING	EMPLOYED FROM | TO BASE SALARY: FIRST | LAST OTHER COMPENSATION	YOUR RESPONSIBILITIES: MAY WE CONTACT EMPLOYER?
2	EMPLOYER ADDRESS YOUR TITLE NAME & TITLE OF SUPERVISOR REASON FOR LEAVING	EMPLOYED FROM | TO BASE SALARY: FIRST | LAST OTHER COMPENSATION	YOUR RESPONSIBILITIES: MAY WE CONTACT EMPLOYER?
3	EMPLOYER ADDRESS YOUR TITLE NAME & TITLE OF SUPERVISOR REASON FOR LEAVING	EMPLOYED FROM | TO BASE SALARY: FIRST | LAST OTHER COMPENSATION	YOUR RESPONSIBILITIES: MAY WE CONTACT EMPLOYER?
4	EMPLOYER ADDRESS YOUR TITLE NAME & TITLE OF SUPERVISOR REASON FOR LEAVING	EMPLOYED FROM | TO BASE SALARY: FIRST | LAST OTHER COMPENSATION	YOUR RESPONSIBILITIES: MAY WE CONTACT EMPLOYER?

Reverse side Figure 1-6.

MILITARY SERVICE

Branch .... Rank at Discharge ....

Date(s) of Entry .... Date(s) of Release .... Type of Discharge ....

Primary Duties: ....

Selective Service Classification ....

ADDITIONAL INFORMATION

Have you ever been convicted of a crime other than a minor traffic violation which involved a fine of $25.00 or less? Yes .... No .... If "yes" give date, place, charge and disposition ....

REFERENCES:

Professional associates or friends, not relatives or former employers.

NAME	Address	Telephone	Occupation

ADDITIONAL COMMENTS

This space may be used for any additional information you wish to submit.

I certify that all information on this application is accurate, and recognize it is subject to check and that my employment and/or continuance thereof may be contingent upon its accuracy.

Signature .... Date ....

PLEASE DO NOT WRITE BELOW THIS LINE

INTERVIEWER'S COMMENTS

Date Note (Test Scores, Referrals, New Information, Disposition, etc.).

References checked: Yes .... No ....

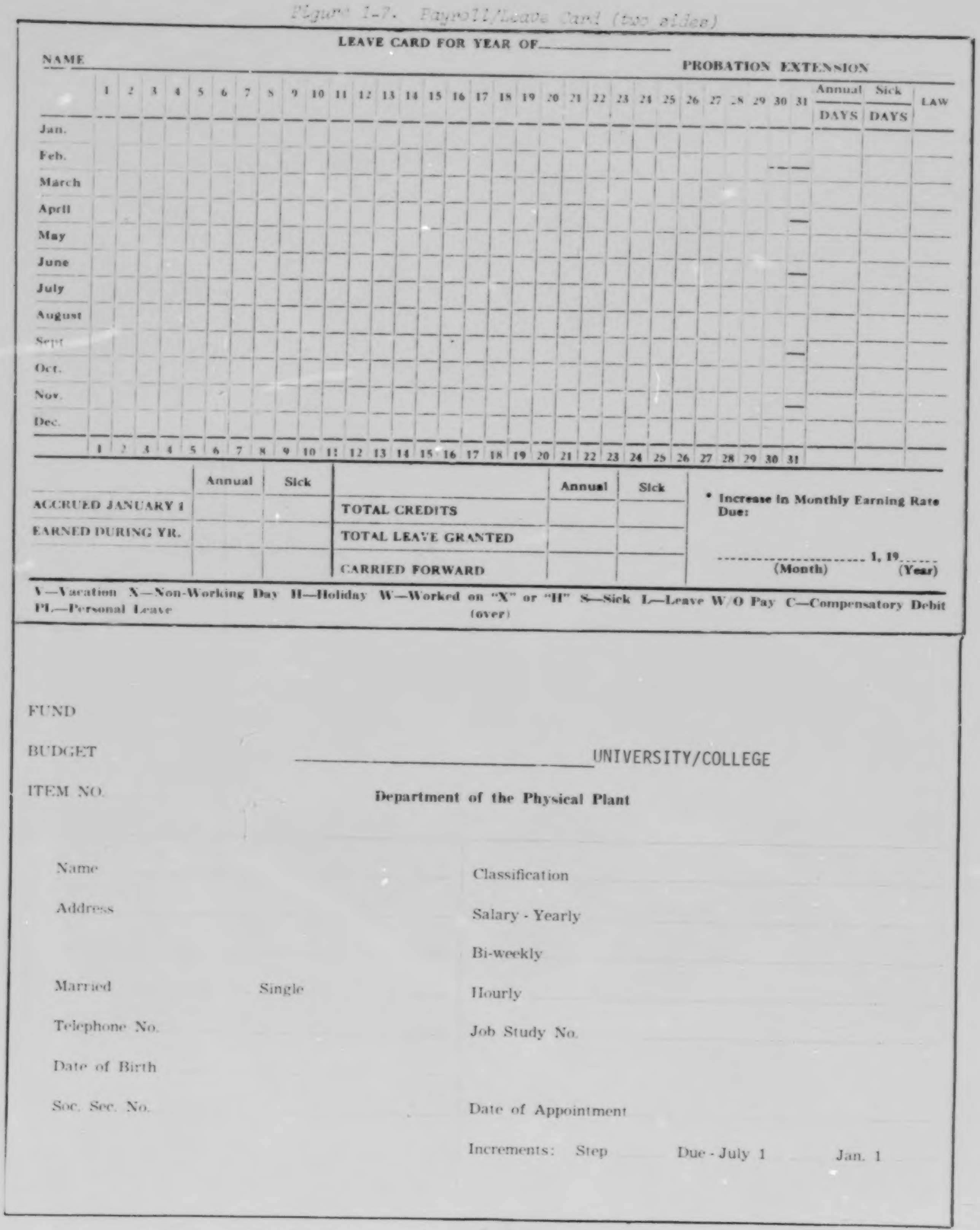


Figure 1-7. Payroll/Leave Card (two sides)

LEAVE CARD FOR YEAR OF________________

NAME **PROBATION EXTENSION**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Annual DAYS	Sick DAYS	LAW
Jan.																																		
Feb.																																		
March																																		
April																																		
May																																		
June																																		
July																																		
August																																		
Sept																																		
Oct.																																		
Nov.																																		
Dec.																																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31			

	Annual	Sick		Annual	Sick
ACCRUED JANUARY 1			TOTAL CREDITS		
EARNED DURING YR.			TOTAL LEAVE GRANTED		
			CARRIED FORWARD		

• Increase in Monthly Earning Rate Due:

------------------------ 1, 19______
(Month) (Year)

V—Vacation X—Non-Working Day H—Holiday W—Worked on "X" or "H" S—Sick L—Leave W/O Pay C—Compensatory Debit PL—Personal Leave

(over)

FUND
BUDGET
ITEM NO.

______________________________UNIVERSITY/COLLEGE

Department of the Physical Plant

Name
Address

Married Single
Telephone No.
Date of Birth
Soc. Sec. No.

Classification
Salary - Yearly
Bi-weekly
Hourly
Job Study No.

Date of Appointment
Increments: Step Due - July 1 Jan. 1

Attendance Records. As backup to payroll cards, the department should maintain complete attendance records. For tradesmen, laborers and others on hourly wages, this means time cards, which the clerk totals on a time sheet. For supervisors, office personnel and others on straight salaries, this means a daily attendance sheet noting any absences. With these documents it is simple to resolve disputes about sick leaves taken, amount of annual leave earned and similar fringe benefits.

Separation Papers. The final item in the employee's file is his separation papers. These include all information pertinent to his accrued benefits, such as leave, retirement pay and the like. To insure that the separation proceeds smoothly, the director might compile a checklist of all pertinent details to be taken care of. An important item is the statement of cause of separation. It should specify whether he resigned to take another job, relocate, advance his career, or was fired. Such information is valuable both to the employee, since he may wish a reference letter from the institution, and also to the school, since planners can use this data in formulating future personnel policies. The data may also prove pertinent to possible unemployment compensation claims and equal opportunity discrimination hearings.

MANAGEMENT PRACTICES

Special personnel problems arise from the nature of physical plant work. Physical plants must operate certain essential services twenty-four hours a day, year round; in most cases it must provide constant security; in all cases it must clean, repair, redesign and remodel without interfering with ongoing school activities.

Recruiting

Because of these problems and the technical skills required for physical plant work, the director might consider helpful some of the following recruiting methods. Finding reliable, trained personnel is a recurring problem, and these methods should supplement, not supplant, efforts of the institution's personnel office.

1. Hire from within. This entails promoting staff members to higher jobs as they become available. The advantages are obvious. Supervisors are familiar with the candidate's character and expertise, and the candidate has firsthand experience with the institution. The latter fact should eliminate the situation in which an applicant leaves quickly because he does not like what appeared initially to be an attractive working environment.

2. Ask staff employees to recommend applicants. They should know the requirements of the job and the skills of the people they recommend.

3. Search out older men in the construction industry. In many cases experienced tradesmen qualified for maintenance and internal modifications no longer desire work outside where they must contend with unpleasant weather conditions.

4. Try the military services. The Navy, in particular, is a useful place to search for machinists, plumbers, electricians, and engineers. Ex-servicemen usually are well-trained in technical and mechanical trades important in physical plant maintenance. Men who have served on shipboard are experienced in keeping equipment in top operating condition and in working as part of a tight-knit organization.

5. Provide equal employment opportunities and develop affirmative action programs. Such programs are not only required by law but have resulted in gaining some excellent employees having been given a chance.

Hours and Schedules

Some physical plant employees work at unusual hours and occasionally accumulate considerable overtime. Custodians, heating engineers and security police often work night shifts. Maintenance men, moving crews and groundskeepers work overtime for several weeks at the beginning and end of each semester.

As standard operating procedure, the director should warn applicants for these positions that such conditions are part of the job, and that supervisors accept no excuses for not complying with overtime requirements.

The director can mitigate these disadvantages in several ways. All night work, for instance, should qualify for some night differential premium, either a flat hourly increase or percentage of the worker's normal rate. According to many state laws, overtime above 8 hours a day must receive additional pay. According to federal statutes, overtime above 40 hours per week on federally supported contracts must also receive overtime pay.

Overtime should be distributed as equally as possible among qualified employees. If an employee refuses overtime on one occasion, he should not be excluded from future opportunities when his turn comes up again.

The director can also adjust schedules to local economic and social conditions. Administrators at many Midwestern schools, for example, hire farmers to clean their buildings during the early morning hours. The farmers report after their first, predawn chores, work short hours, clean their assigned buildings, and return to their fields before the first students report to class.

For more traditional services such as maintenance and groundskeeping, it is more efficient to have employees report earlier than students. This reduces traffic problems and provides lead time for emergency maintenance or special preparation for the day's classes.

In drawing up work schedules, the director should consult with his supervisors and employees to determine the most appropriate work times. A simple change like moving the reporting time up or back fifteen minutes to coincide with local bus schedules may ease transportation problems and also improve worker morale.

To maintain morale, it is best for all employees to work essentially the same number of hours every day. Scheduling certain personnel, such as office workers, for a shorter work day can be injurious to morale. Once established, shorter work weeks seldom are changed.

Standby. Another common schedule problem is the standby roster. For some essential services, it is necessary to place skilled employees on call in case an emergency requires immediate repairs. While on standby status, the worker must remain accessible while off duty, perhaps by telling a supervisor or dispatcher where to reach him at all times. One way to handle this problem is to list each employee, perhaps alphabetically, and require each to take a turn. The rotation need not be inflexible; individuals willing to trade can arrange switches among themselves. To justify the disruption of his leisure, it is traditional and advisable to provide some small premium for remaining on standby alert, and to pay travel expenses and at least two hours pay to the employee who is called back.

Training

Orientation. Training begins with orientation. First the personnel officer covers such topics as general institutional regulations, payroll information, vacation and leave policies. Then the physical plant director and supervisors instruct the employee in details pertinent to his particular position, such as hours, duties and safety procedures. They should also introduce him as soon as possible to all his co-workers; this tactic alone pays dividends by reducing psychological tensions that can disrupt his performance.

A checklist such as the example in Figure 1-8 is a practical way to see that each employee receives complete and uniform information during orientation. Encouraging him to ask questions is the best way to insure that he understands the information. At the end of orientation, some directors ask the worker to sign a statement that he understands departmental policies on all topics covered.

In-service Training. Training continues with in-service instruction to develop skills and attitudes he needs to work well, develop his potential and contribute to the institution. Specific suggestions about how to train men for various phases of physical plant work are included in other chapters of this book. One general point worth stressing here is that accurate record keeping is essential to any training program. The department should maintain complete records of all instruction each employee receives during his career at the institution. This information is important for planning, promoting employees and providing equitable opportunities for those interested in further education and training.

Figure I-8.

CHECKLIST FOR NEW EMPLOYEE ORIENTATION

WHO'S WHO ?

Introduce employee to:
  Department or Division head
  Immediate supervisor
  Fellow workers

WHAT'S WHAT !

Work and organization of department
The function of employee's specific unit
Job duties of new employee
Job performance standards
Method of securing supplies and equipment

WORK SCHEDULE am pm am pm am pm am pm am pm am pm am

Hours   Overtime   Lunch   Coffee breaks

PAYROLL INFORMATION $ ¢ $ ¢ $ ¢ $ ¢ $ ¢ $ ¢ $ ¢ $ ¢ $

Pay periods and pay checks

PERSONALS + - + - + - + - + - + - + - + - + - + - + -

Appearance and grooming
Lockers
Restrooms
Transportation and Parking
Smoking

TIME OFF =

Vacation and holiday scheduling
Sick and injury leave policies
Responsibility of employee for notification when
  sick, injured, late, etc.

Retraining. A second general point about training: Certain programs should be repeated annually. Safety procedures, for instance, deserve an annual review. Emergency plans should be updated annually and redistributed to insure that all workers know how to react if the campus is beset by blizzard, flood, fire, riot, or serious utility disruptions. In the future, plans for energy conservation may also become a recurring concern of all physical plant employees.

Supervisory Training. Supervisors handle most in-service training. As key members of the physical plant staff, they need careful training. In addition to instructing employees, they assign work, enforce standards, evaluate performance, receive complaints and resolve conflicts. They must be experts, therefore, in their work specialty, institutional policies and interpersonal relationships. On most campuses, the personnel office provides seminars for supervisors on such topics as new management techniques, motivation and communication, both interpersonal and intra-institutional.

Probation

After training there should be a period of probation--a time for the employee to prove himself--to demonstrate the abilities and attitudes the job requires. Probation periods vary from sixty days to six months with an occasional extension to one year. The worker should be warned when hired that continued employment is contingent upon satisfactory performance during this period. And he should be helped. His supervisor should periodically counsel the employee to help him master any difficulties. At the end of probation the supervisor reviews his work with him to determine whether he will continue in the position.

At that point or earlier, the department can summarily dismiss the worker. After probation, however, the department must first follow the institution's disciplinary procedures before releasing an employee.

Conduct

A common cause for dismissal is violation of the school's conduct code. This code usually appears in the employee handbook issued by the personnel office, and the physical plant director should insist that all new employees read it. He should also enforce the code rigorously. Regulations about behavior, drinking, obscenity, insubordination, tardiness, absences, theft, and similar offenses will mean little if the physical plant director and his supervisors do not apply them consistently. If violations are ignored, they may soon become engrained in the staff's mode of operation. When conduct problems develop, the personnel office can provide counsel and advice to administrators, supervisors and employees involved.

Discipline

Disciplinary measures, like conduct guidelines, should be spelled out. Thefts, felonies and similar offenses usually merit immediate discharge. In lesser cases, a four-step disciplinary procedure is traditional, since it is cheaper for the department to reform a worker than to hire and train a new one.

1. Discipline begins with a verbal reprimand for the first mistake.

2. Next comes a written reprimand with the dates and times of the first and second offenses.

3. Suspension follows to penalize the worker financially.

4. The final step is dismissal. With this step, as with the second and third, the employee should receive a written summary of previous offenses and penalties as justification for the department's action.

Grievances

To protect employees from unfair treatment, the department should formalize and publicize grievance procedures. In these cases a four-step sequence is traditional:

1. The worker presents the supervisor with a verbal or written complaint.

2. If the supervisor cannot satisfy the worker, then both present their versions to the physical plant director. With written statements from the parties involved, the director should call a conference to explore the problems. It is essential to retain as much human contact as possible, especially because each side tends to establish an adversary position at this point.

3. The next conference is with the institution's personnel officer. He may have more expertise in resolving conflicts and more objectivity in viewing the particular issues.

4. The last step is appeal to a board of disinterested persons at an administrative level above that at which the complaint originated. This board makes final disposition.

Grievance procedures are important guarantees for employees and should be easily accessible. They are also time-consuming, however, and all parties should attempt to resolve differences fairly and in good will before resorting to final arbitration. Frequent grievance procedures involving the same employee, supervisor or department are signs that something is seriously amiss and the causes should be identified and corrected if possible.

Collective Bargaining

Collective bargaining is coming quietly and late to many American campuses, arriving decades after it was established in the major American industries. Most of the states now passing enabling legislation for collective bargaining in higher education are patterning their actions after the National Labor Relations Act. This trend portends complicated negotiations for numerous college administrations. What each institution needs is a realistic policy, one that has been readied long before negotiations begin. An institution that ignores employee efforts to organize and bargain can lose friends and good workers; one that accedes to inflated demands can lose money. Key suggestions for forming a policy are:

1. Deal with one association or union for all nonacademic employees. This means one negotiation session and one contract instead of countless sessions, different contracts, and recurring jurisdictional disputes.

2. Do not antagonize either union employees, representatives or organizers. Instruct supervisors that they are not to take names, threaten, cajole or in any way treat these employees differently. Such tactics only make unionization inevitable and negotiations more difficult.

3. Be prepared: Analyze the opening demands carefully to compile an accurate cost breakdown for all raises, benefits, and work changes that bargainers are asking for or may accept. When it comes to trade-off time, negotiators have to know exactly what they gain and what they lose in each exchange.

The agenda for these meetings should be prepared in advance, and to insure a productive meeting instead of a rambling gossip session, it should be adhered to as closely as is compatible with open discussion of honest concerns.

The role played by the physical plant director and his supervisors is obvious; they advise the personnel administrator in these negotiations. The director does not deal directly with any individual union. Instead he counsels the institution's negotiating group. His advice should include cost breakdowns for all work changes under debate.

Supervisors help the director compile this cost analysis. They are the men on the line who have the most accurate understanding of the practical effect of changes in work operations. They must also maintain harmonious relations during the negotiations, meet production requirements, and manage smooth transition when new agreements go into the contract.

Morale

Nearly all issues stressed in this chapter concern employee morale, either directly or indirectly. It is appropriate to conclude, therefore, with a brief discussion of several additional methods for improving or maintaining good morale. Highly effective are employee meetings. When scheduled regularly, every three months for instance, these meetings serve several valuable purposes. The director and his supervisors can review the department's performance and explain its plans and programs for the coming quarter. Such discussions help make employees an integral part of the total operation.

Communication at these meetings should flow in both directions. This is an excellent opportunity for the director to listen to his staff and find out firsthand what problems they face, and what solutions they would like to try. Such discussion can increase the sense of participation, provide valuable practical suggestions, and help the director spot and solve many small problems before they grow into large ones.

Newsletters can also boost morale, and with modern cheap reproduction methods, they can be economically produced at even the smallest schools. They can provide public recognition for outstanding performance, announce new programs, introduce new employees, and report news of employee activities.

Parties and picnics are time-honored traditions at many schools. In some cases employees pay for the Christmas party and the spring picnic out of their own salaries; in others, they share the cost with the institution. It is important that the department or the institution participates in some important way, perhaps by providing school facilities free of charge. These social functions encourage friendliness and camaraderie among employees--qualities that generate a better working environment.

The basic structure of any organization can be no stronger than the individuals in it. There are some poorly organized departments that function satisfactorily because of strong leadership and high morale of its members. It will be rare to find an efficient and smooth functioning department that has good structure but is staffed by incompetence and indifference.

2

FINANCIAL ADMINISTRATION

INTRODUCTION.. 33-35

THE PHYSICAL PLANT DEPARTMENT BUDGET.................... 35-62
Figure 2-1: Personal Services Budget Request
Figure 2-2: Travel and Equipment Budget Request
Figure 2-3: Department Budget
Figure 2-4: Physical Plant Formula Budget Illustrative Example
Figure 2-5: Graph A - Hours of Operation
Figure 2-6: Graph B - Intensity of Use
Figure 2-7: Graph C - Intensity of Landscape Development
Figure 2-8: Budget Presentation Device

THE INTERNAL AUDIT.................................... 62-64

PLANT INVENTORY....................................... 64-66
Figure 2-9: A Typical Inventory Record

INSURANCE... 66-68

PHYSICAL PLANT MATERIALS AND SUPPLIES.................. 69-71

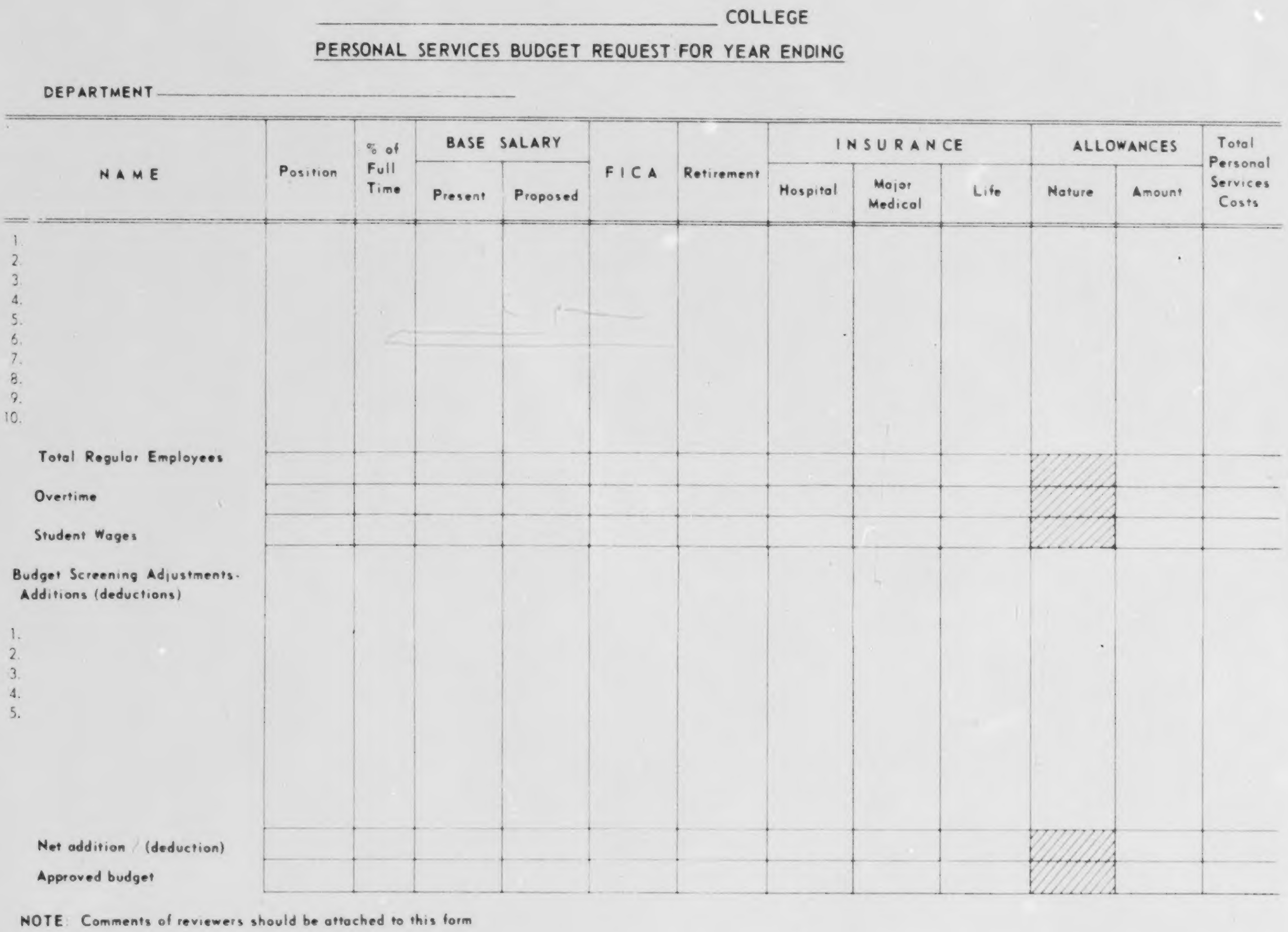
2

FINANCIAL ADMINISTRATION

BUDGETS, COST RECORDS, INVENTORIES, INSURANCE, AND STORES are the primary financial considerations a physical plant director must handle at a small school. Although the director is usually chosen for his technical and managerial expertise, he must learn to manage money as well as men. Otherwise the physical plant department he leads will be unable to fulfill its major service missions efficiently.

THE PHYSICAL PLANT DEPARTMENT BUDGET

The most important task is preparation of the budget. In essence a budget is a plan for financial operation that proposes expenditures over a specified period and identifies sources of funds. It is a control tool: The asking budget shows how much money is needed and where it could originate; the working budget shows how much money is allocated and where it is spent. If expenses exceed projections, a tightly kept budget enables the director to spot overruns early enough to cut down expenditures, to amend the budget or to request additional funds from the institution's chief financial administrators. Figures 2-1, 2-2 and 2-3 taken from NACUBO's publication, PLANNING, BUDGETING AND ACCOUNTING MANUAL, illustrates how a physical plant departmental budget is developed.



____________________ COLLEGE

PERSONAL SERVICES BUDGET REQUEST FOR YEAR ENDING

DEPARTMENT ____________________

NAME	Position	% of Full Time	BASE SALARY		FICA	Retirement	INSURANCE			ALLOWANCES		Total Personal Services Costs
			Present	Proposed			Hospital	Major Medical	Life	Nature	Amount	
1.												
2.												
3.												
4.												
5.												
6.												
7.												
8.												
9.												
10.												
Total Regular Employees										▨		
Overtime										▨		
Student Wages										▨		
Budget Screening Adjustments-Additions (deductions)												
1.												
2.												
3.												
4.												
5.												
Net addition / (deduction)										▨		
Approved budget										▨		

NOTE: Comments of reviewers should be attached to this form

Figure 2-1.

______________ ______________ COLLEGE

TRAVEL AND EQUIPMENT BUDGET REQUEST FOR YEAR ENDING ______________

DEPARTMENT ______________________________

DESCRIPTION	REQUEST YEAR ENDING JUNE 30, 19	FOR CENTRAL BUDGET REVIEW	
		REQUEST ADDITIONS/ DELETIONS	RECOMMENDATION YEAR ENDING JUNE 30, 19
TRAVEL ITEMS (detail list)			
TOTAL TRAVEL AMOUNT			
EQUIPMENT ITEMS (detail list)			
TOTAL EQUIPMENT AMOUNT			

NOTE Comments of reviewers should be attached to this form

Figure 2-2.

______________________ COLLEGE

DEPARTMENTAL BUDGET FOR YEAR ENDING ______________________

DEPARTMENT ______________________

CLASSIFICATION OF EXPENSE	SOURCE OF FUNDS	FOR USE BY DEPARTMENT				FOR CENTRAL BUDGET REVIEW	
		ACTUAL – Year Ended June 30, 19	BUDGET – Year Ending June 30, 19	PROJECTION – Year Ending June 30, 19	REQUEST – Year Ending June 30, 19	REQUEST ADDITIONS / (DELETIONS)	Recommendations – Year Ending June 30, 19
SALARIES AND RELATED COSTS	Unrestricted						
	Restricted						
	SUBTOTAL						
STUDENT WAGES	Unrestricted						
	Restricted						
	SUBTOTAL						
TRAVEL	Unrestricted						
	Restricted						
	SUBTOTAL						
SUPPLIES AND OTHER EXPENSES	Unrestricted						
	Restricted						
	SUBTOTAL						
EQUIPMENT	Unrestricted						
	Restricted						
	SUBTOTAL						
TOTAL DEPARTMENTAL BUDGET							

STATISTICAL DATA

No. of Degree Candidates – FT
No. of Degree Candidates – PT
F.T.E. – Faculty
F.T.E. – Non Academic Employees
No. of Courses
No. of Sections
No. of Student Credit Hours

NOTE: Comments of reviewers should be attached to this form

Figure 2-3.

The planning goal is to develop sound budgets to support worthwhile programs, rather than to tailor programs to fit allocations. The worth of educational programs and the money allocated lie outside the responsibility of the physical plant administrator, but his good budgeting practices can turn his department into a more efficient tool for realizing ends with available funds. With budgets that are well-planned, professionally developed and adequately controlled, the physical plant director serves well his school, department, and himself. Following certain general practices can help him realize these goals.

ASSIGNING COSTS

The first task is clarifying who pays for what. This means spelling out what the physical plant budget pays for and what it does not. Usually the physical plant budget carries the costs of operating, maintaining, cleaning, and repairing all buildings and basic classroom furniture in them. The department also bears the cost of heat, ventilation, light, power, and plumbing--all utilities required for normal use. For anything else, someone else should pay.

A department requiring special educational equipment should pay for its installation, maintenance, repair, and replacement. Departments with heavy research needs usually pay for required equipment out of departmental research budgets. In such cases, the physical plant department charges for services such as moving equipment, setting up chairs, installing public address systems, arranging for special utilities, and off-duty or overtime custodians.

A more complicated question is who should pay for major repairs beyond what is required because of normal wear-and-tear, major renovations and alterations required for new programs. An interdepartmental committee should administer a separate fund for such repairs. Composed of staff, faculty and student members, this committee receives and evaluates all requests for remodeling and improvements. Such a procedure eliminates the need for the physical plant director or business officer to make arbitrary decisions and run the risk of "playing favorites."

Many colleges run a variety of self-supporting services such as computer centers and teaching aids departments. These operate on the campus as they would in the marketplace; they pay their operating and maintenance costs out of earned income, as should auxiliary enterprises such as intercollegiate athletics, bookstores, dormitories, dining halls, cafeterias, and vending services.

Special conferences, professional conventions, convocations, and workshops sponsored by college departments should also reimburse the physical plant department for all direct costs.

COST ACCOUNTING

The second step in effective budgeting is devising a cost accounting method that accurately reflects cost assignments. The purpose of cost accounting is systematic accumulation of financial information. With good information, an administrator can measure the relative efficiency of his organization, plan short-range and long-range improvements and double-check ways in which allocated funds are spent. Cost accounting can also mean uniform workloads, proper inventory levels and accurate trend data for controlling future costs.

The key to a cost accounting system is a comprehensive classification of major accounts. This accounts chart, like the departmental organization chart, mirrors the major functions of the department. In April, 1971, the Association of Physical Plant Administrators approved the accounts classifications chart outlined on the following pages. An administrator at a small school may want to combine or eliminate some subsections to adapt the chart to the scope of a particular operation.

ASSOCIATION OF PHYSICAL PLANT ADMINISTRATORS
CLASSIFICATION OF ACCOUNTS
April, 1971

MAJOR ACCOUNTS

1. Physical Plant Administration
2. Building Maintenance
3. Custodial Services
4. Utilities
5. Landscape and Grounds Maintenance
6. Major Repairs and Renovations
7. Other Services

OUTLINE OF COSTS UNDER EACH MAJOR ACCOUNT

1. PHYSICAL PLANT ADMINISTRATION

All activities necessary to carry out the duties of management and administration for all areas under the jurisdiction of the Physical Plant Division are included. Examples of activities are:

1.1 ADMINISTRATION

Salaries, wages, employee benefits, travel, equipment, and other operating costs required for:

Administrator;
Assistant Administrators;
Office personnel including accountkeeping done by the Physical Plant Department such as payroll, billing, material ordering, personnel records, and dispatching of work orders;
Other administrative operating costs including supplies, materials, pro rata share of telephones, postage, computer rental, accounting machine costs, and career training programs.

1.2 ENGINEERING normally includes:
Salaries, wages, employee benefits, travel, equipment, and other costs required to provide technical and engineering services to carry out effectively functions assigned and funded in the Physical Plant Division. Includes staff personnel such as engineers, architects, draftsmen, estimators, schedulers; and preparation of documents for contractual maintenance and renovations; also includes analysis of systems and modes of operation, plant records, etc. Preparation of architectural and engineering plans and specifications for alterations and new construction are normally funded from other sources.

2. BUILDING MAINTENANCE
Building maintenance includes all items related to routine repair of buildings, structures and appurtenances, including normal recurring repairs and preventative maintenance. Include the following:

2.1 INTERIOR AND EXTERIOR OF BUILDINGS

2.1.1 Plumbing, heating, air conditioning, and ventilation
2.1.2 Electrical repairs of all types including primary and secondary systems, and certain lamp replacements (requiring special ladders and rigging) and maintenance of outdoor lighting fixtures (excludes energy costs)
2.1.3 Carpentry and cabinetmaking
2.1.4 Painting and glazing
2.1.5 Hardware, locks, keys, closers, and records
2.1.6 Roofing and sheetmetal work, including downspouts and gutters
2.1.7 Welding and necessary machine work
2.1.8 Elevators and similar equipment
2.1.9 Miscellaneous building repairs such as tuckpointing, blinds, etc.

2.2 MAINTENANCE OF GENERAL PURPOSE CLASSROOM FURNITURE AND EQUIPMENT within the building not inventoried to a department.

2.3 MAINTENANCE OF UTILITY DISTRIBUTION SYSTEMS INSIDE THE BUILDING including electrical, heating, process steam, water lines, gas lines and sewer lines (both storm and sanitary).

2.4 OPERATING AND REPLACEMENT COSTS OF ALL EQUIPMENT AND MATERIAL AND TOOLS USED IN CONNECTION WITH BUILDING MAINTENANCE excluding hand tools furnished by employees.

Building maintenance may also provide services on a reimbursable basis to other accounts. Examples of those are auxiliary enterprises, special teaching support facilities, research, and departmental inventoried equipment.

3. CUSTODIAL SERVICES

Custodial services include all costs related to custodial services in building interiors. Does not include auxiliary enterprise buildings.

3.1 SALARIES, WAGES AND EMPLOYEE BENEFITS OF CUSTODIANS, SUPERVISION, AND SERVICES REQUIRED FOR CLEANING BUILDING INTERIORS.

3.2 SMALL SETUPS ONLY WHERE MATERIALS FOR SPECIAL SETUPS ARE STORED OR KEPT WITHIN THE SAME BUILDINGS.

3.3 SNOW REMOVAL ON BUILDING STEPS PLUS 5 FEET OF SIDEWALK IN EACH DIRECTION.

3.4 OTHER OPERATING COSTS SUCH AS PAPER, PAPER TOWELS, TISSUE, WAX, ERASERS, CHALK, CLEANERS, AND OTHER MATERIALS AND SUPPLIES.

3.5 OPERATING AND REPLACEMENT COSTS OF ALL EQUIPMENT USED IN CONNECTION WITH CUSTODIAL SERVICES AND LAMP REPLACEMENT READILY ACCESSIBLE WITHOUT SPECIAL LADDERS AND RIGGING.

3.6 ELEVATOR OPERATION ON NONAUTOMATIC EQUIPMENT.

4. UTILITIES

Utility services include all costs for energy for heating, cooling, light and power, gas, water, and any other utilities necessary for the operation of the physical plant and normally include:

4.1 PAYROLL COSTS OF ALL SUPERVISORY AND OPERATING PERSONNEL IN CONNECTION WITH UTILITIES.

4.2 OPERATION AND MAINTENANCE OF HEATING AND POWER PLANT EQUIPMENT INCLUDING WATER PLANT AND SEWAGE DISPOSAL PLANTS.

4.3 OPERATION AND MAINTENANCE OF EQUIPMENT IN CENTRAL AIR CONDITIONING PLANT.

4.4 CONTRACTUAL COSTS FOR PURCHASE OF ELECTRICITY, WATER AND SEWAGE TREATMENT.

4.5 OPERATION AND REPLACEMENT COSTS OF ALL EQUIPMENT USED IN CONNECTION WITH PRODUCTION OF UTILITIES.

4.6 MAINTENANCE OF UTILITY TUNNELS, OUTDOOR DISTRIBUTION SYSTEMS FOR ELECTRICITY, GAS, STEAM, COMPRESSED AIR, CHILLED WATER, HIGH TEMPERATURE WATER, DOMESTIC WATER, AND SANITARY AND STORM DRAINS. The expense does not include open ditch drainage.

5. LANDSCAPE AND GROUNDS MAINTENANCE

Grounds maintenance includes operation and maintenance of campus landscape and grounds. Exclude areas not intensively maintained out of the Physical Plant budget and/or other areas for which the Physical Plant is reimbursed.

5.1 SALARIES, WAGES AND EMPLOYEE BENEFITS OF ALL SUPERVISORY AND OPERATING PERSONNEL IN CONNECTION WITH GROUNDS.

5.2 ALL AREAS OF THE MAIN CAMPUS MAINTAINED. GROWING THINGS AS TREES, GRASS, SHRUBS, FLOWERS, NURSERY STOCK INCLUDING SEEDS, FERTILIZERS, AND PLANT MATERIALS.

5.3 MAINTENANCE OF ROADS AND WALKS, PARKING AREAS, IRRIGATION SYSTEMS, SIGNS, ETC.

5.4 SNOW REMOVAL.

5.5 MAINTENANCE OF GOLF COURSE, ATHLETIC PRACTICE FIELDS, AND STADIUM VARSITY FIELDS. (Costs are normally excluded from physical plant budgets.)

5.6 MAINTENANCE OF PHYSICAL EDUCATION, INTRAMURAL AND ROTC DRILL FIELDS.

5.7 MAINTENANCE OF OPEN DITCH DRAINAGE, FENCES, RETAINING WALLS AND RIP RAP.

5.8 CARE OF MISCELLANEOUS FIXED EQUIPMENT SUCH AS BENCHES, SHELTER HOUSES, ETC.

5.9 OPERATION AND REPLACEMENT COSTS OF ALL EQUIPMENT USED IN CONNECTION WITH GROUNDS MAINTENANCE.

6. MAJOR REPAIRS AND RENOVATIONS (Special Line Items)
Major repairs and rehabilitation includes all costs for major nonrecurring repairs and major deferred maintenance items. Major projects are those costing more than $10,000.

6.1 COST OF SALARIES OF SUPERVISORY AND OPERATING PERSONNEL CONNECTED WITH MAJOR REPAIRS AND RENOVATION PROJECTS.

6.2 LINE ITEM SPECIAL ALLOTMENTS AND ESSENTIALLY LARGE IMPROVEMENT ITEMS.

6.3 REPLACEMENT COSTS OF ALL EQUIPMENT USED IN CONNECTION WITH MAJOR REPAIRS AND RENOVATIONS.

6.4 COSTS RELATED TO PLANNING, DESIGN OR ADMINISTRATION OF MAJOR REPAIRS AND RENOVATIONS.

7. OTHER SERVICES
Other essential services not consistently within the Physical Plant Department, yet frequently assigned, are:

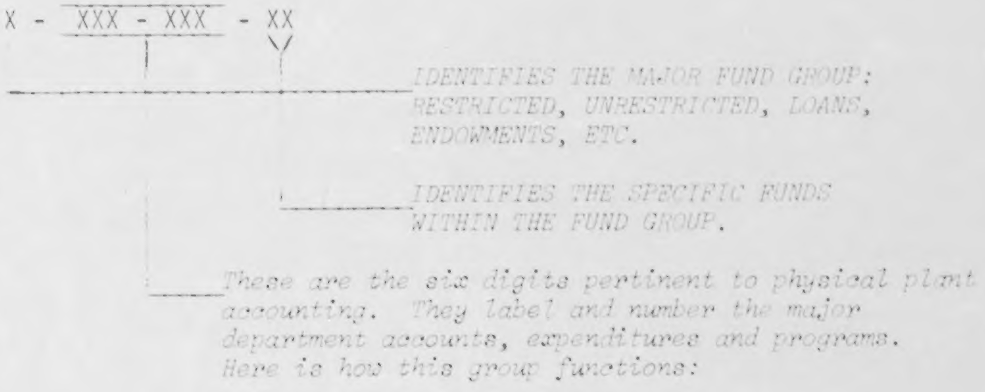
Automotive Repair
Bus Systems
Construction Planning and Inspection
Communications (i.e., Telephone and Telegraph)
Mail and Messenger Service
Property Insurance
Purchasing and Stores
Safety
Security and Traffic
Solid Waste Disposal
Trucking and Moving

ACCOUNT NUMBERING

A cost accounting system must have a numbering code to organize all pertinent information and in most cases to feed it into electronic data processing equipment. At the request of the National Association of College and University Business Officers, Peat, Marwick, Mitchell and Company developed a nine-digit system that eventually may enable schools using it to tie into a national cost reporting network. Although the national system is still years away, many schools large and small have already found some version of their coding structure adequate to their accounting needs. What follows is an adaptation of their approach as presented in the PLANNING, BUDGETING AND ACCOUNTING MANUAL published by NACUBO.

The Coding Structure

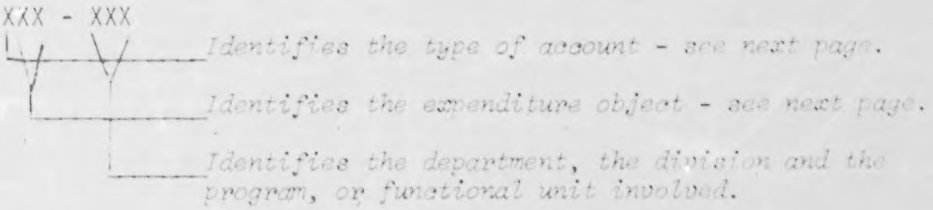
Since the nine-digit structure organizes information for the entire institution, not all digits will be pertinent to discussion of physical plant accounting. The total system is usually laid out as:



IDENTIFIES THE MAJOR FUND GROUP: RESTRICTED, UNRESTRICTED, LOANS, ENDOWMENTS, ETC.

IDENTIFIES THE SPECIFIC FUNDS WITHIN THE FUND GROUP.

These are the six digits pertinent to physical plant accounting. They label and number the major department accounts, expenditures and programs. Here is how this group functions:



Identifies the type of account - see next page.

Identifies the expenditure object - see next page.

Identifies the department, the division and the program, or functional unit involved.

The esoteric labels used in the coding structure can best be defined through typical examples, such as:

Type of Account

1. *Revenue - Educational and General*
2. *Revenue - Student Aid*
3. *Revenue - Auxiliary Enterprises*
4. *Expenditures - Educational and General*
5. *Expenditures - Student Aid*
6. *Expenditures - Auxiliary Enterprises*
7. *Assets*
8. *Liabilities*
9. *Fund Balances*

Expenditure Object Code

00 - Salaries
10 - Wages (hourly)
20 - Student Labor
30 - Staff Benefits
40 - Travel
50 - Supplies, Materials and Expenses
60 - Equipment
70 - Repairs to Equipment
80 - Contracts
90 - Other items

Under this coding structure, a job numbered 400-822 would read:

4 = the funds for the project come from the expenditure series for educational and general services.

00 = the expenditure object--salaries

8 = identity of the Building Maintenance Division and the program of maintaining general office furniture and equipment

22 = identity of the Physical Plant Department in the insitution-wide coding

Each institution, of course, has unique needs and programs. For that reason a national reporting network to provide a uniform format for all schools requires more research. Hopefully, this brief explanation suggests how the system developed by Peat, Marwick, Mitchell and Company can be modified to meet the needs of most schools.

Institutions using this system usually require that the central business office furnish the physical plant department with a cumulative record--on a monthly basis--of all charges and encumbrances against each account and code on the chart. The practice produces a running balance for each category and records adequate for all categories.

Cost Records

A major benefit of the kind of accounting system described is a file of cost records usable in scheduling and estimating new work and planning budget requests. Since the physical plant department handles a number of unexpected jobs during the school year, it is appropriate to identify two major kinds of cost records.

1. Special Records. The physical plant department inevitably incurs special costs as a result of undertaking emergency work. Natural disasters, such as hurricanes and floods, and man-made disasters, such as student disorders, always create work the department is equipped to accomplish quickly. These special jobs entail special record keeping because the tasks fall outside the normal accounting system. In the wake of every emergency period, therefore, the physical plant director should immediately order his subordinates to report all extraordinary expenses directly to him. He will need such records to justify requests for additional funds, reimbursements or insurance claims.

2. Experience Records. The director should also know the cost of performing each traditional task, such as maintaining a building, repairing a utility system or mowing a section of campus. These cost records provide several kinds of important information. They show which employees are performing well and which are not. They constitute proof that an assigned job was actually done. They record repeated equipment breakdowns, warning that total replacement may soon be necessary. In general, these records most essential to both budget control and budget preparation, and a good cost accounting system will retrieve them quickly, if they have been compiled accurately. The primary means for compiling them is the work order system.

The Work Order System

The basic purpose of the work order system is accounting for the following major elements of cost:

1. Labor. Numbers 00, 10, 20, and 30 in the expenditure object code
2. Supplies, materials and expenses. Numbers 40, 50 and 60
3. Administrative overhead.

In a few sophisticated versions of the system, a charge might also be levied for the use of equipment in order to build a reserve for repair and replacement. Since a complete explanation of work orders follows in Chapter 3, only a short summary appears here to explain how the system compiles data for cost records.

The basic unit is the separate work order number assigned to each job. The basic principle is simple: Each work order number will be the means of collecting all cost elements for that job.

The easiest element to compile is the cost of materials. Two methods are widely used:

METHOD 1. The storeroom clerk records the items issued for a job on the work order form which the workman carries with him. He may also price items if he has updated cost data on hand, but usually the work order clerk will do this after the worker returns the completed work order.

METHOD 2. The supply agent hands separate issue slips to the workman while keeping a duplicate for his files. When the slips come in, the work order clerk prices each and totals those issued for that particular work order.

The most difficult element to compile is the cost of labor. For one particular job, the labor may accumulate over a considerable period of time and involve numerous workmen. A choice of methods is available:

METHOD 1. If only one employee is needed, he carries a single copy of the work order with him and each day records the amount of time spent on the assignment. When several workmen are assigned to the same project, the supervisor, foreman or leader records all their time on one form. The cost clerk totals and prices their time.

METHOD 2. For each job, a time clock card is punched which the clerk collects, totals and prices to compile a running total for the duration of the job. Since this technique takes the time recording completely out of the workman's hands, it eliminates any attempt to pad his time estimates.

For both methods, a time distribution sheet may prove helpful. The clerk enters the time on the sheet, converts it to dollars and cents and keeps a running total.

For pricing charge-out work, it is recommended that once a year the department establish a uniform hourly rate for each trade. For example, one rate should apply to all carpentry jobs, another to all plumbing work. A further refinement would be separate uniform rates for trained artisans and helpers in each trade.

Administrative and overhead costs can also be handled two ways:

METHOD 1. The hourly rate established for each trade can include a predetermined percentage that covers administration and expenses such as vacations, sick leaves, supervision, and wear and tear on tools and equipment.

METHOD 2. The department can add a percentage to the labor and material costs for the entire job.

Since each refinement of the work order system increases its administrative costs, it should result in greater efficiency. The refinements mentioned above add extra steps to the process, but they will also improve the record of daily time and material costs, discourage loafing, uncover dishonesty, and provide more accurate cost records for future planning.

PREPARING BUDGETS

A major payoff of good cost accounting is during budget drafting when administrators prepare and justify their request for the next year. At most colleges, administrators handle the complexities of physical plant budgeting through some variation of the following formulas. All but one relies heavily on historical records.

1. Present Funding plus Justified Increases. The most widely used and least effective method amends the existing budget by increases to meet the cost of new buildings, to take care of deferred projects and to cover inflation. For example, a physical plant department with a million dollar budget and a 10% increase in floor space would ask a $100,000 increase for the new buildings plus an additional $66,000 for inflation, assuming a 6% annual increase. Note that the inflation percentage is calculated on the amended budget rather than the original base. The popularity of this system derives from its simplicity, not its precision.

2. The Pie Slice. This method is simpler, yet gives the physical plant department a predetermined percentage of the total institutional budget. What this percentage should be is not generally agreed upon, even by adherents of this approach because few schools assign identical duties to their physical plant departments.

3. Workload Standards. A more sophisticated approach uses industrial engineering techniques to estimate work time and unit costs for typical jobs. By identifying the different kinds of jobs the department performs, measuring and averaging the work times for each and establishing job frequencies, administrators can estimate the total budget requirements.

   A summary of this method as developed by J. McCree Smith at North Carolina State University appears in Chapter 4, Custodial Services.

4. Unit-Size Estimates. On the theory that physical plant costs increase in direct proportion to the increase in school size, some administrators base their budget estimates on an appropriate measure such as gross floor area, total building volume, enrollments, acreage, or some combination of them. Complicated refinements of this approach utilize several submeasures to render it a more precise predictor.

Rapid university expansion following World War II stimulated the search for a simpler and more comprehensive unit-size approach formula. Some of the best known work during this period came from Walter Kraft in 1949, L. L. Browne in 1955, W. H. Badgett in 1964, John Harding in 1967, and Calvin Greene in 1970. One of the most recent refinements was developed in 1972 by George O. Weber, editor-in-chief of this volume and William H. Horsey, planning engineer at the University of Maryland.

The Weber Formula

This formula, like all the others, depends substantially on historical information. In this case, the personnel-to-size ratios used in the budget projections are based on 27 years of uniform records at the University of Maryland, College Park. Since this method incorporates flexible multipliers that make it easily adaptable to small schools also, a short summary is given in the following pages.

The goal of the formula is a cost estimate for the four major functions a physical plant department typically provides: administrative and professional service, building operation and maintenance, grounds maintenance, and cleaning. To this total, the physical plant administrator adds estimates for utilities and additional services assigned to his particular department. The formula operates by deriving personnel requirements from gross floor area and then deriving material costs as a ratio of personnel costs.

Assumptions. Three major assumptions underlie the method:

1. The ratio of material costs to labor costs used for these four categories are fairly typical of the broad spectrum of institutions of higher education.

2. The general mix of buildings at a particular school contains enough compensating types to allow a formula approach to budgeting. Buildings can be typed in numerous ways, but the major classifications nearly all include a compensating variety, as the following examples suggest:

    A. Purpose--general-use types for classrooms, offices and teaching laboratories; and special-use types for libraries, gymnasia and research laboratories

    B. Structural Materials--frame, masonry and prefabricated panels

    C. Structural Systems--wall-bearing, beam-and-slab concrete, flat slab concrete, and structural steel

    D. Age--old structures with simple mechanical systems and new ones with complex systems

    E. Size--high-rise with elevators and low-rise with walk up stairways

3. Geographic and climatic conditions also tend to compensate. The cost of removing snow at a northern school, for example, is balanced by the cost of irrigating and maintaining the grounds through the winter at a southern school.

Variables. Three major variables complicate the computations: hours of operation, intensity of use and intensity of landscape development. In its simplest form, the Weber Formula is based on a class week of 45 hours, a ratio of 190 square feet per full-time equivalent student and a campus whose floor area equals 25% of its land area. For each variable a separate multiplier has been graphed to adjust the formula to a variety of other campus conditions. These multipliers are used about half way through the computations.

Elements. The major elements of the formula are:

A = Gross square footage of floor space the physical plant department operates and maintains.

B = Personnel required to perform desired functions.

C = Projected average annual earnings of personnel.

D = Numerical multiplier for computing the material component of the budget.

8,000 = The constant indicating the number of gross square feet this formula assigns for each man under optimal conditions.

10,000 = The constant indicating the number of gross square feet per man assigned under minimal conditions.

Formulae. The heart of the approach is the following formulae:

$$\frac{A}{8{,}000} \text{ (under optimal conditions)} = B \text{ and } B \times C \times D = \text{Annual Budget Requirement.}$$

$$\frac{A}{10{,}000} \text{ (under minimal conditions)} = B \text{ and } B \times C \times D = \text{Annual Budget Requirement.}$$

Computations. Computing the budget according to these formulae requires six steps. Figure 2-4 is an example illustrating how to apply these formulae to a given set of data.

Step One:
Determine accurately the gross square footage of floor space to be served by the physical plant, and divide by 8,000 for optimum personnel requirements or by 10,000 for minimum personnel requirements.

Step Two:

Distribute personnel across the four (4) major subdivisions using the following percentages.

1. Administrative and Professional Services... 5%)
2. Building Maintenance and Operation.........25%)
3. Landscape and Grounds Maintenance..........10%) 100%
4. Custodial Services.........................60%)

Step Three:

At this point, adjust this personnel total for the first two variables--hours of operation and intensity of use. From graphs A and B, choose the appropriate multipliers and multiply the 100% personnel total by them. Graphs A and B are identified as Figures 2-5 and 2-6.

Handle the variable for landscape development differently. After selecting the multiplier from graph C, Figure 2-7, apply it to the 10% number allotted to the Grounds Division only, not to the 100% personnel total.

Add these three results to the original 100% total to produce an adjusted number for the staffing requirement. Repeat step two by redistributing these positions across the four divisions according to the percentages given.

Step Four:

To determine the salary costs, multiply each adjusted personnel total by the average annual salary projected for that division.

1. Multiply the number of personnel required for Administrative and Professional Services by the projected annual average salary for this group.
2. Multiply the number of personnel required for Building Maintenance and Operation by the projected annual average salary for this group.
3. Multiply the number of personnel required for Landscape and Grounds Maintenance by the projected annual average salary for this group.
4. Multiply the number of personnel required for Custodial Services by the projected annual average salary for this group.
5. Add these products to determine the total Salary Budget.

Each labor total proves a base for estimating material costs in that category.

PHYSICAL PLANT FORMULA BUDGET ILLUSTRATIVE EXAMPLE

BASIC STATISTICAL AND OTHER DATA NECESSARY FOR COMPUTATIONS

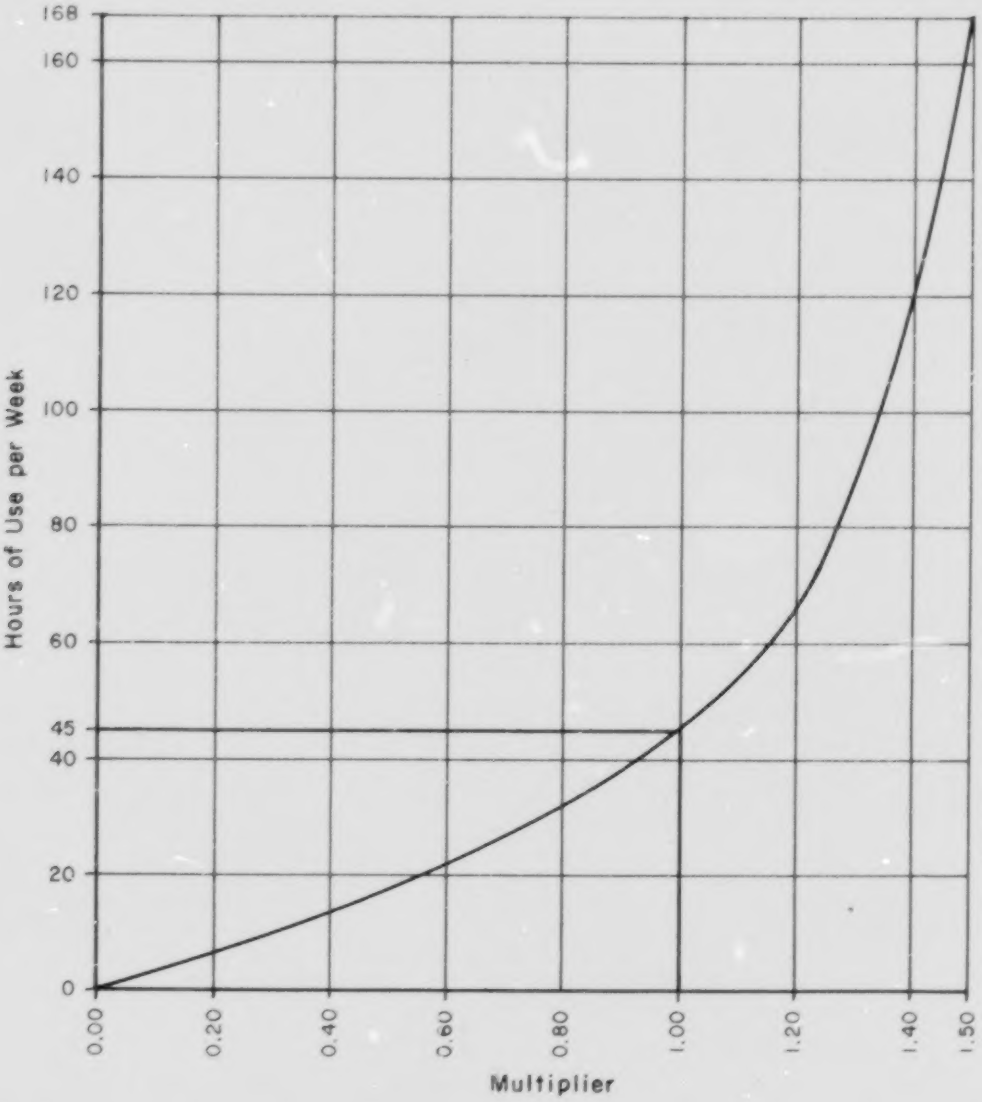
1. Gross sq. ft. of Academic and Support Buildings......... (excluding dorms and auxiliary enterprises)	400,000 sq. ft.
2. Total Acreage..	20 acres
3. Enrollment FTE...	1,600 FTE
4. Hours of Operation (Day and Part time Night)............	60 hrs/wk
5. Projected Average Annual Salaries:	
a. Administrative & Professional Personnel.............	$10,000.00
b. Buildings Maintenance & Operations Personnel........	$ 8,000.00
c. Grounds Personnel...................................	$ 7,000.00
d. Custodial Personnel.................................	$ 6,000.00

	RESULTS OF COMPUTATIONS MINIMUM	 OPTIMUM
Step One		
Minimum Staffing (Physical Plant) 1 person/10,000 GSF		
Optimum Staffing (Physical Plant) 1 person/ 8,000 GSF		
Required Personnel.....................................	*40*	*50*
Step Two		
5% = Administrative & Professional Personnel..........	*2*	*3*
25% = Buildings Maintenance & Operations Personnel.....	*10*	*12*
10% = Grounds Personnel...............................	*4*	*5*
60% = Custodial Personnel.............................	*24*	*30*
TOTAL STAFF BEFORE ADJUSTMENTS	*40*	*50*
Step Three		
For multipliers see Graphs A, B and C.		
Adjustment for Graph A, Hours of Operation:		
60 hrs/wk = 1.18.......................................	*+ 7*	*+ 9*
Adjustment for Graph B, Intensity of Use:		
400,000/1,600 = 250 250 GSF/FTE.....................	*- 4*	*- 5*
Adjustment for GROUNDS STAFF ONLY:		
10 Acres Bldgs + 40 Acres Land requires 1.25 Staff..	*+ 1*	*+ 2*
Net Adjustment	*+ 4*	*+ 6*
TOTAL STAFF AFTER ADJUSTMENTS	*44*	*56*
Step Four		
PERSONNEL (LABOR) FUNDS:		
Admin & Prof (2 x $10,000) (3 x $10,000).....	*$ 20,000*	*$ 30,000*
Blg Op & Mtce (11 x $ 8,000) (14 x $ 8,000).....	*88,000*	*112,000*
Grounds (5 x $ 7,000) (6 x $ 7,000).....	*35,000*	*42,000*
Custodial (26 x $ 6,000) (33 x $ 6,000).....	*156,000*	*198,000*
44 Total Staff 56 Subtotal	*$299,000*	*$382,000*
Step Five		
MATERIALS FUNDS:		
Admin & Prof ($ 20,000 x .087) ($ 30,000 x .087)..	*$ 1,740*	*$ 2,610*
Blg Op & Mtce ($ 88,000 x .429) ($112,000 x .429)..	*38,852*	*48,048*
Grounds ($ 35,000 x .429) ($ 42,000 x .429)..	*15,015*	*18,018*
Custodial ($144,000 x .111) ($198,000 x .111)..	*159,840*	*219,780*
Subtotal	*$215,447*	*$288,456*
Step Six		
ANNUAL BUDGET REQUIREMENT: (exclusive of Utilities and and other functions assigned to Physical Plant such as Safety and Security)		
PERSONNEL (LABOR) FUNDS...........................	*$299,000*	*$382,000*
MATERIALS FUNDS...................................	*215,447*	*288,456*
ANNUAL BUDGET REQUIREMENT	*$514,447*	*$670,456*

Figure 3-4.

Formula Budgeting for Physical Plants of Universities and Colleges
ADJUSTMENT TO BUDGET FORMULA

HOURS OF OPERATION



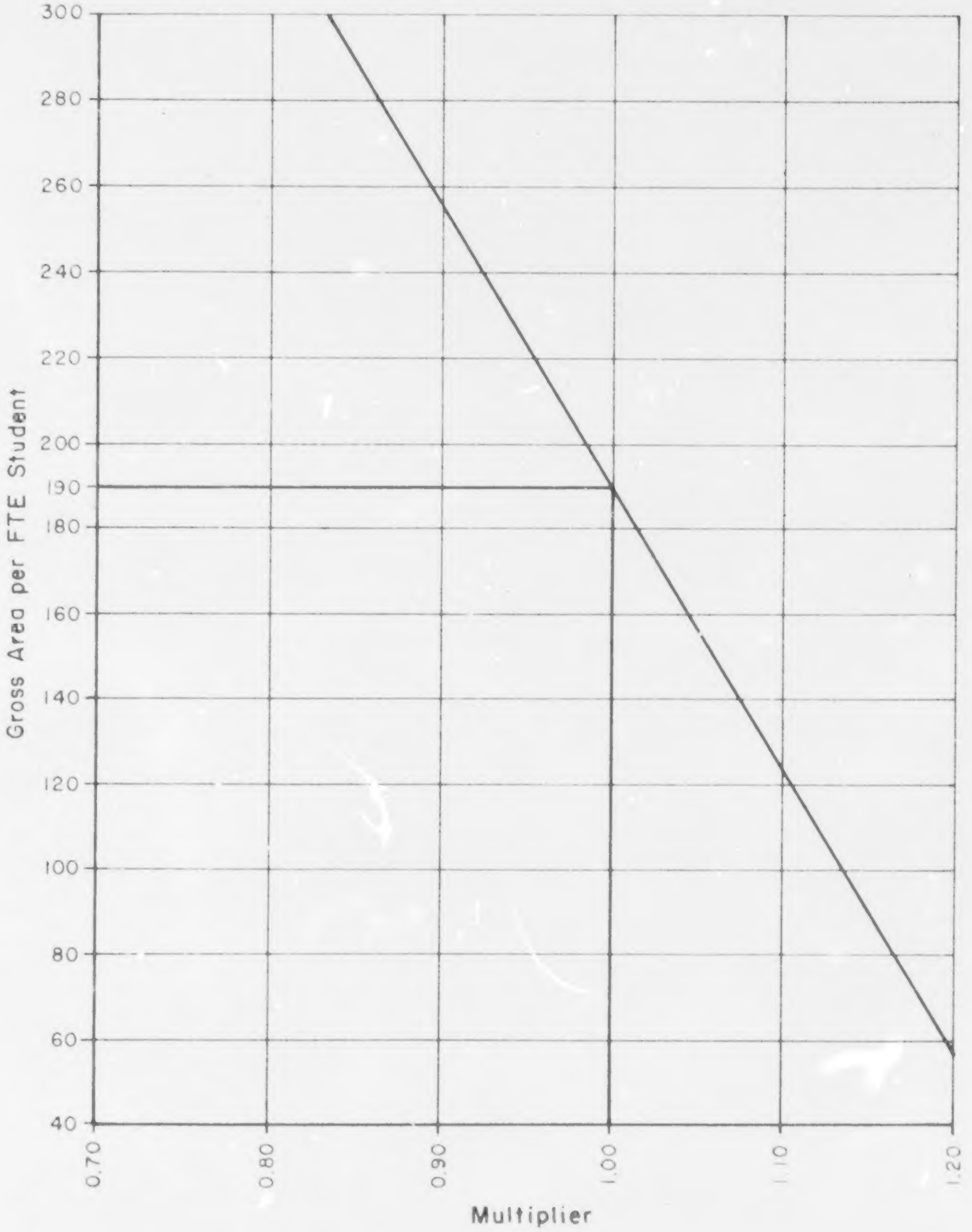
GRAPH A

Figure 2-5.

68

ADJUSTMENT TO BUDGET FORMULA

INTENSITY OF USE

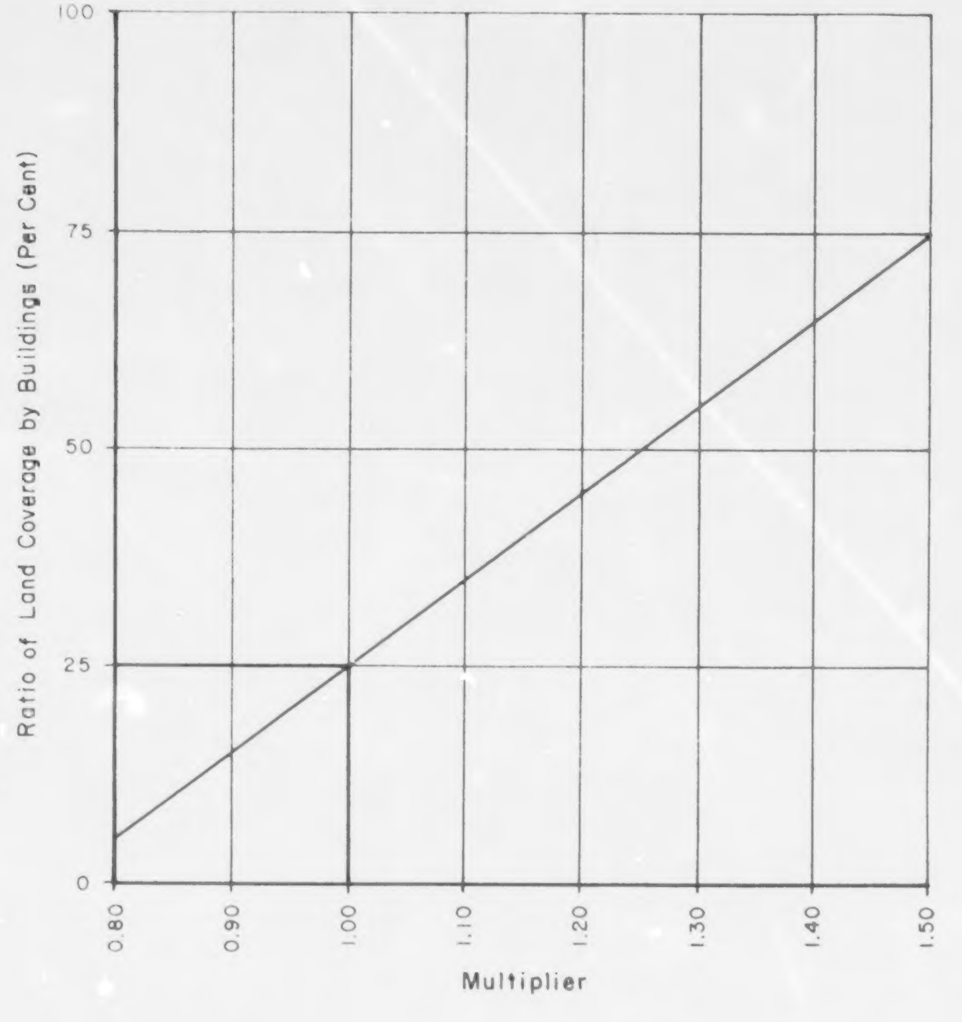


GRAPH B

Figure 2-6.

ADJUSTMENT TO BUDGET FORMULA

INTENSITY OF LANDSCAPE DEVELOPMENT



GRAPH C

Figure 8-7.

Step Five:
Develop the materials-and-supplies costs by using the multipliers shown below. Derived from extensive historical records, they reflect the materials-to-costs ratios typical for these service categories. For example, Buildings Maintenance usually spends 30% of its budget allotment on materials and the remaining 70% on labor. Use the multiplier 30/70 (or 0.429) with the labor total for Buildings Maintenance (Step Four, No. 2) to find the material costs for this category.

Here are the appropriate operations, ratios and multipliers:

1. Multiply the labor costs for Administrative and Professional Services Costs (Step 4, No. 1) by 8/92 or 0.087.
2. Multiply the labor costs for Building Maintenance and Operation Costs (Step 4, No. 2) by 30/70 or 0.429.
3. Multiply the labor costs for Landscape and Grounds Maintenance Costs (Step 4, No. 3) by 30/70 or 0.429.
4. Multiply the labor costs for Custodial Services Costs (Step 4, No. 4) by 10/90 or 0.111.
5. Add these products to determine the total Materials Budget.

Step Six:
Add the Materials Budget found in Step Five to the Salary Budget found in Step Four for each of the four services provided. The result is the total budget required annually for the four functions in the formula.

The major advantage of a formula based on labor costs is that it accounts for inflation by projecting annual increases in labor costs, probably the most reliable general cost index. One of the disadvantages derives from the fact that personnel performance and productivity can vary widely enough across the country to weaken the validity of the 8,000 and 10,000 square-feet-per-man constants. In choosing which number to use, the administrator will have to make a difficult judgment based on his knowledge of factors such as worker morale and training and local economic conditions. The value of uniform records for this decision cannot be overemphasized. They provided the basis for developing this formula, and maintained for even three years can provide the basis for adapting it to an institution of any size in any location.

A final point about budget preparations: Anticipate new expenses. The most obvious and simplest to predict are those occasioned by new buildings. From experience records of similar structures, administrators can project with fair accuracy the operation and maintenance costs for each new building that "goes on the line." More difficult to predict are repairs of deteriorating systems and structures. In these cases, the best information comes from the tradesmen who live with each building and its problems throughout the year; they can tell when the air conditioning is likely to fail or when a roof must be replaced. Most difficult to anticipate are costs for emergency work. The special records discussed earlier related to emergencies such as natural disasters are the only sources of information. From these, administrators can compile a line item request for contingency funds.

PRESENTING THE BUDGET

Budget time is the single most critical period of the year for the physical plant department, since appropriations can determine the success or failure of its programs. Unfortunately, even the best-planned budget can suffer if not presented properly to decision-making authorities. If a department perenially comes up short of its request, it may not be asking in the right way. What follows are a few suggestions on how to present a budget.

Accuracy and completeness are essential to budget presentations. Accuracy means no padding--a practice tempting to the administrator who assumes cuts are always coming. Budgets should express only the department's real needs. With good experience records, the director can provide hard data to persuasively back up his requests. Over the years accurate requests will build up a backlog of honesty that will pay off in better allocations.

Completeness means providing for each line item an explanation of the consequences of cuts or delays. Cliches about "a stitch in time" and "an ounce of prevention" are appropriate here. Deferring maintenance work can easily skyrocket the project costs many times the original estimate.

The intangible consequences of widespread cuts should also be explained. One is low morale among plant tradesmen and custodians. When the job load becomes unrealistically large, employees become discouraged, develop a "what's-the-use attitude," and unconsciously decrease their output. Other problems grow out of the general deterioration of the educational environment--problems such as lower morale among students and faculty, disrespect for property and vandalism.

To convey his budget message, the director should compile illustrations, including line graphs, bar graphs and even cartoons like the one shown in Figure 2-8. These devices might be useful to financial administrators when they carry the department's requests to the trustees or legislators for approval. The director cannot expect anyone else to tell his story better than he can. He might, therefore, also provide his superiors with handouts that organize supporting evidence and verbalize the requests exactly in his words.

THE INTERNAL AUDIT

A final but essential element in an effective budget program is the internal audit. Although few small colleges can afford a staff auditor solely for the physical plant department, every college needs some kind of regular internal examination of its financial system. If the physical plant department does not have an auditor, it should use the college auditor. If the school does not employ one, the institution should contract with a private professional for periodic checks.

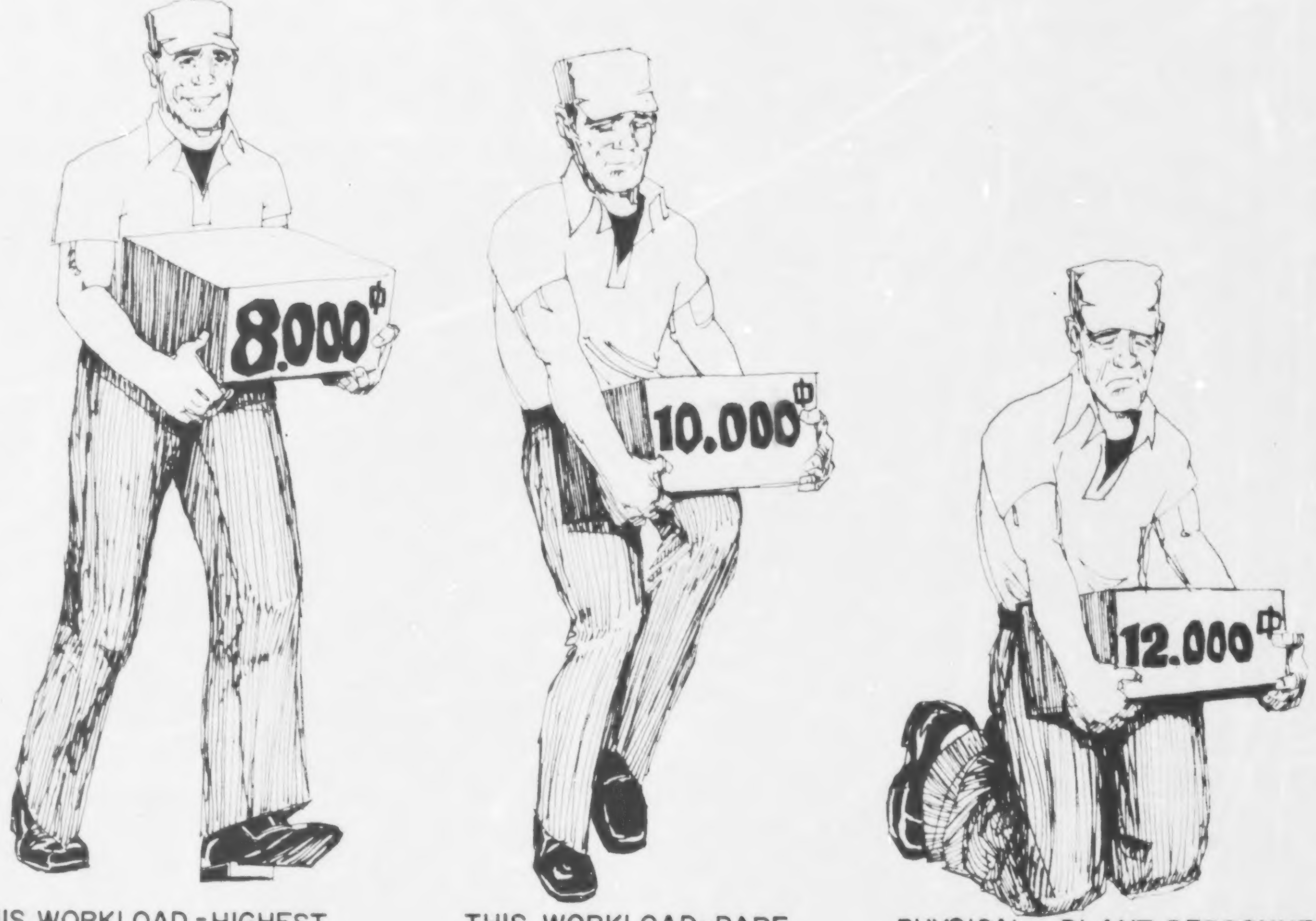
An audit is essentially a review and appraisal of the financial program either *in toto* or in part. This review and appraisal focuses on the following factors:

Adequacy of accounting, financial and operating controls;

Compliance with established policies;

Quality of performance;

Quality of the information management receives and compliance with governmental and insurance regulations.



THIS WORKLOAD = HIGHEST STANDARDS AND QUALITY PERFORMANCE

THIS WORKLOAD = BARE MINIMUM STANDARDS

PHYSICAL PLANT PERSONNEL CANNOT BUDGE - IT

FIGURE 2-8

Two additional functions deserve special note. First, the regular audit serves as a primary safeguard against fraud and dishonesty. Secondly, it keeps honest administrators alert. As stewards of other people's money, they know they must account for their stewardship through the audit when their decisions must withstand critical scrutiny. The strong administrator does not hesitate to make an unusual decision in an exceptional case, but he should record the reasons for his decision while his memory is fresh. Otherwise, the auditor may misunderstand the situation. The auditor, of course, should be disinterested: he should not be engaged in the activities he reviews and appraises.

The Institute of Internal Auditors sums up the purpose of a regular audit:

> The overall objective of internal auditing is to assist all members of management in the effective discharge of their responsibilities, by furnishing them with objective analyses, appraisals, recommendations, and pertinent comments concerning the activities reviewed. The internal auditor, therefore, should be concerned with any phase of business activity wherein he can be of service to management.

PLANT INVENTORY

At most colleges, an inventory of assets is the primary responsibility of the chief business officer, but he will often delegate a large part of the job to the physical plant director. The physical plant represents a considerable portion of the school's financial worth, and its elements should be recorded at value, just as the revenues, investments and endowment funds are.

Inventory policies differ widely among educational institutions, because each school has different informational and control needs. For inventory purposes, however, most schools employ the following classifications for recording their physical plant assets:

1. Land. All parcels or tracts owned by the college
2. Buildings. All structures and permanently affixed equipment such as built-in furniture and machinery
3. Improvements other than buildings. Items such as gate, streets, walks, conduits, pipe tunnels, trees, and landscaping
4. Equipment. All movable pieces including library books, art collections and even livestock

The equipment category requires further explanation. To distinguish a piece of equipment from expendable supplies, many schools define as equipment any item having a unit cost of $100 or more and a life expectancy of two years or more. Should this method leave the inventory cluttered with low-cost items, the minimum value can be raised.

When an item, be it a library building or a lawn mower, goes onto the inventory, it must be numbered and checked periodically for an up-to-date record of its current use and condition. The task of marking the items usually falls to the physical plant department. The major marking techniques used include stencils, electric burning devices, wood and metal punches, gummed plastic labels, and tape.

ESSENTIAL RECORDS

Inventory responsibilities usually are divided between the business officer who maintains land records, and the physical plant director who provides surveys and appraisals whenever the school contemplates buying or selling a tract. The inventory supervisor takes charge of the movable equipment inventory. The physical plant director keeps records for buildings, utilities, improvements, and movable equipment assigned to his department.

The essential information he keeps for each building is date of construction or acquisition, cost, source of funds, location, use and all pertinent technical data. This technical information consists of a complete description of the structure, including reduced scale plans, floor plans, area and volume totals, construction materials and "as-built" drawings updated for any subsequent remodelings, renovations, and alterations.

For improvements other than buildings, such as gateways and fencing, the essential information would be simple subsidiary records showing date of construction or acquisition, original cost, subsequent costs, and all pertinent technical data. For equipment, the director simply follows the established procedure of the business officer or the inventory supervisor. Figure 2-9 shows a typical Inventory Record.

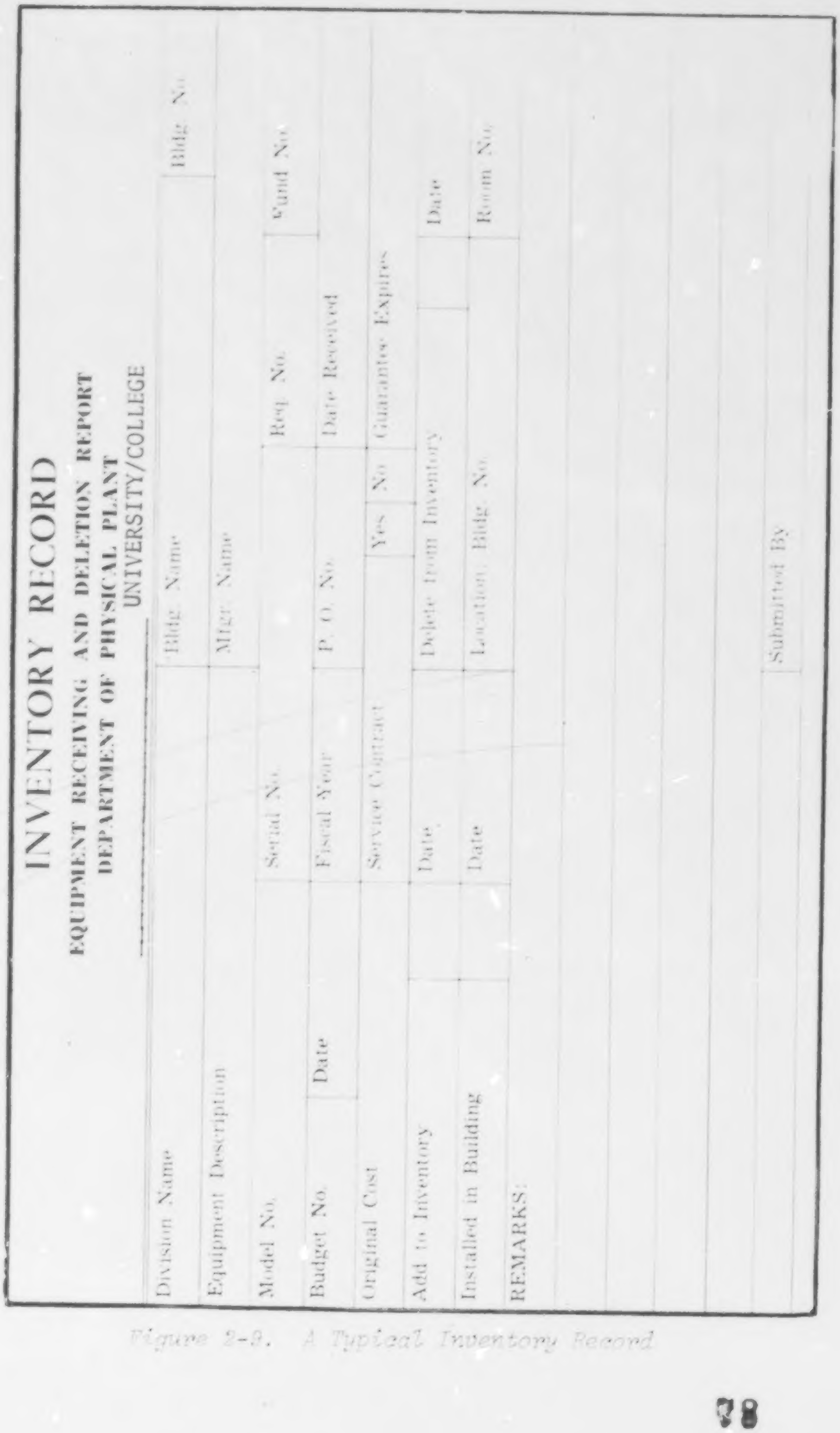
A well-organized inventory system benefits management by showing which items are currently in use in each department and which are surplus available for interdepartmental loan or resale. When the plant ledgers are set up by department, the inventory assigns clear responsibility for use and upkeep of the equipment. It quickly reveals any unexplained disappearances and thereby discourages theft. Finally, an inventory is important for the insurance program: It designates the value of insured items involved in loss claims, and it often produces reduced premiums.

INSURANCE

The importance of an adequate insurance program is obvious. What constitutes adequacy, however, is not always self-evident, especially to one unfamiliar with the insured items. Although the business officer will usually take charge of the total program or appoint an insurance officer, the physical plant director should inform himself about insurance principles and problems. As resident authority on the land and buildings, he should be prepared to advise the insurance officer about items requiring coverage and to review insurance policies. Therefore, periodically with the responsible administrator he needs to familiarize himself with the following insurance coverages:

1. Property. This kind of policy may be needed because the standard fire policy only insures against loss by fire and lightning.

2. Extended Coverage. A special endorsement to the standard fire policy protects against loss from windstorms, hail, explosions, riots, smoke damage, and other hazards. Extended coverage is usually required by the lender whenever a building is pledged as security.



INVENTORY RECORD

EQUIPMENT RECEIVING AND DELETION REPORT
DEPARTMENT OF PHYSICAL PLANT
________________ UNIVERSITY/COLLEGE

Division Name		Bldg. Name				Bldg. No.
Equipment Description		Mfgr. Name				
Model No.		Serial No.			Req. No.	Fund No.
Budget No.	Date	Fiscal Year	P. O. No.		Date Received	
Original Cost		Service Contract	Yes	No	Guarantee Expires	
Add to Inventory		Date	Delete from Inventory			Date
Installed in Building		Date	Location: Bldg. No.			Room No.

REMARKS:

Submitted By

Figure 2-9. A Typical Inventory Record

3. Boiler and Machinery. Fire policies also do not cover loss from failure or explosion of boilers or other pressure vessels. A separate policy is needed, but it should be coordinated with fire and liability coverages.

4. Elevator. Standard comprehensive liability policies do not cover loss from malfunctioning elevators. A separate policy is required.

5. Builder's Risk. In many cases the builder will be required to provide protection as part of the cost of the building. Often, however, the owner will add coverage progressively, usually at one month intervals, to cover the completed portions against fire, windstorm and the other risks discussed above. Such policies should also extend to materials and equipment on the site but not yet installed.

For information on these questions, the director should consult the chief business officer for guidance and might also refer to RISK MANAGEMENT AND INSURANCE by John F. Adams, published by the National Association of College and University Business Officers.

Any insurance program requires periodic inspections. Representatives for the underwriters will make such inspections to see that the grounds, buildings and boilers are hazard-free, and that the security system, fire warning alarms and sprinkler networks all are functioning adequately. In short, they will want to assure themselves that the physical plant operation is one that minimizes the risk of large claims. The physical plant director should appoint a staff representative to accompany the insurance inspectors and to note all his criticisms. Every physical plant department should have its own safety inspection program, but insurance inspections may spotlight previously unnoticed problems.

PHYSICAL PLANT

MATERIALS AND SUPPLIES

There are several good reasons for central stores in small institutions: a ready supply of commonly used items, reduced delivery time and savings through quantity purchasing. The disadvantages are increased costs for planning, staff and facilities. Foremost among the administrative problems are developing a good working relationship with the purchasing department, ordering economic quantities, controlling inventory and keeping accurate records.

PURCHASING

Common sense and experience dictate that purchasing and central stores be separated to minimize the potential for collusion and dishonesty. They also dictate that physical plant and purchasing work closely. Principally, this means agreeing on procedures to cover routine reordering and emergency procurement. When one department is constantly circumventing established procedures in order to get its work done, it is time to restructure the method.

The ideal relationship works something like this: The appropriate physical plant employee has responsibility for determining quantity, quality and timing for supplies and materials. If he wants to insure quality by specifying brand names, he gives the purchasing agent a choice of three to work with. The purchasing agent, on the other hand, has the final responsibility for determining the particular vendor and the best price.

The best way to manage ordering and other internal problems of central stores is through a planning committee made up of employees from major divisions of the physical plant department and purchasing. Therefore, an experienced plumber, for example, would recommend the proper quantities and specifications of pipes and fittings. Carefully kept records from several years also indicate future needs accurately enough to guide reordering of major items.

To simplify ordering and inventory controls, J. Leslie Hicks of Denison University developed the 80-20 theory, one of the few formula approaches to these problems. After analyzing commercial, industrial and educational operations, Hicks found that 80% of the inventoried items usually represent only 20% of the inventory's dollar value, and conversely that 20% of the items usually constitute 80% of the total value. Since the cost of carrying an inventory usually runs 16 2/3% of the inventory value, he recommends:

1. Ordering only a one-month supply of high cost items totaling 80% of the dollar value; and
2. Ordering a three-month supply of the low-cost items totaling 20% of inventory value.

These percentages should be adjusted whenever the purchasing department can benefit from price reductions.

INVENTORY LEVELS AND CONTROLS

The following procedures help maintain an efficient inventory control system.

1. Let the planning committee determine inventory levels to rule out excessive purchases and shortages.
2. Have this committee establish and periodically review purchase quantities, ordering levels, quality levels, and minimum and optimum inventory levels for each major supply.
3. Centralize under one department all physical inventory handling, such as receiving and storing.
4. Keep perpetual inventory records to the maximum extent justified by cost.
5. Arrange with the internal auditor for a periodic physical inventory.
6. Check receiving operations to insure that all items are counted and verified for compliance with specifications.

7. Prepare receiving reports for the business office.
8. Insist that all withdrawals be supported by issue tickets identifying the work order and buildings involved.

RECORDS

Two suggestions about simplifying stores records:

1. Dispense with detailed inventory cards on storage bins. It is usually sufficient to note the minimum stock and ordering levels on bin labels.
2. Dispense also with accounting for broken lots of small-value items such as nails and screws. As soon as a keg or box is opened subtract the full amount from the inventory total. The cost of record keeping does not justify more detailed accounting.

3

BUILDINGS MAINTENANCE and OPERATION

INTRODUCTION.. 73-75

SCOPE... 75-76

PHILOSOPHY.. 77

ORGANIZATION AND STAFFING................................. 77-83
    Figure 3-1 : Sample Organizational Pattern
    Figure 3-2 : Sample Organizational Pattern
    Figure 3-3 : Suggested Equipment List for Independent Shops

CONTRACTORS... 84-85

PREVENTIVE MAINTENANCE.................................... 85-94
    Figure 3-4 : Tickler Tab File
    Figure 3-5 : Foreman's Daily Report

WORK ORDER SYSTEM... 94-122
    Figure 3-6 : Suggested Form for Work Request
    Figure 3-7 :)
    Figure 3-8 :)
    Figure 3-9 :)   Various Work Order Samples
    Figure 3-10:)
    Figure 3-11:)
    Figure 3-12:)
    Figure 3-13: (3-13a) Sample Labor Estimating Guide for Work Orders
    (3-13b) Jobs Performed Most Frequently by Basic Shops

APPENDIX:
    3-A SAMPLE PAINT SPECIFICATIONS FOR EXTERIOR PAINTING..........123-127

3

BUILDINGS MAINTENANCE and OPERATION

ALONG WITH GROUNDS AND UTILITIES SYSTEMS, an institution's buildings constitute its physical plant. Their maintenance and operation consume a major portion of the physical plant department's annual budget. To what end goes so much time, energy and talent? To keep these structures functional, attractive, and economical to operate, the ideal is to keep them ageless, the realistic, to maintain the status quo and delay decay.

And such a task is far from simple.

SCOPE

Buildings maintenance and operation requires an organization capable of emergency, preventive and corrective work on a wide variety of structures and systems.

The structural work alone includes foundations, floors, walls, doors, windows, and roofs. It calls for men skilled in handling concrete, mortar, masonry, wire mesh, steel reinforcing rods, flashings, lumber, and wall and floor coverings as varied as paint, linoleum and vinyl asbestos. If the buildings maintenance and operation division can only hire two men, one of them should be a general purpose artisan, probably a carpenter capable of working on several of these components; the other should be capable of at least care of the systems within the structure.

Systems to be maintained include wiring, pipes, ducts, elevators, and escalators built into a structure. Such maintenance calls for men capable of working on systems as complicated as electrical lighting, power distribution, plumbing, air conditioning, ventilation, compressed air, gas, fire alarms, and sprinklers.

With many of these jobs, airtight distinctions between maintenance functions and operations functions would be arbitrary and inaccurate. Although a majority of BM&O work clearly can be called maintenance, several important jobs can be called operation tasks; for example, adjusting a temperature control system or switching a two-pipe system from heating to air conditioning cycle. A few jobs, replacing filters in an air conditioning system, for example, can be defined either way. Since the same personnel handle all these tasks, this chapter uses the terms interchangeably.

An airtight distinction should be drawn between maintenance and operations work that is traditionally budgeted within the BM&O division and charge-back work performed as an extra service for another department. The distinction between normal and extra services is important primarily for budgetary reasons. When the physical plant department performs major repairs, alterations and renovations, it should be reimbursed from the budget of the asking department or from a special fund set aside for these contingencies. The same is true for maintenance and repair work on portable equipment such as computers, microscopes, centrifuges, and other equipment in the inventory of other departments.

Protecting his budget requires that the physical plant director draws clear distinctions and sticks to them. If he alters his policy to help people with problems, he may seriously erode his budget. He also may inadvertently encourage unrealistic impressions about his department's capabilities or encounter charges of favoritism. To protect the budget the work order system must include clear procedures for recording charge-backs and reimbursable jobs.

PHILOSOPHY

Another distinction worth stressing pertains to maintenance philosophies. The two concepts that prevail in the general maintenance field and often clash on particular campuses are corrective maintenance and preventive maintenance. The first attitude emphasizes dealing with problems after they occur and is a necessary element in any adequate maintenance program. When the corrective approach comprises the institution's total program, as it often does when budgets are anemic, it quickly leads to crisis maintenance--in the long run, the most expensive kind of program.

Preventive maintenance emphasizes finding and fixing potential problems before they disrupt building operations. Although a good preventive maintenance program requires an initial outlay of time and money for proper organization, it usually returns the cost many times by minimizing potential damage, reducing emergency overtime work and eliminating expensive rush purchasing. A preventive maintenance program can support but never supplant a corrective program.

ORGANIZATION

AND

STAFFING

To handle preventive, corrective and emergency maintenance, the BM&O staff at a large university might properly employ a dozen groups of specialists in various building trades, with each group operating under several supervisors. At a small college, however, the maintenance staff often consists of a handful of generalists--men who are jacks of several trades. The supervisor often is the plant director.

To build a staff at a small school, the director begins with the following basic tradesmen:

> A carpenter, hopefully one who can handle cabinetmaking, hardware, locks, screening, glazing, puttying, caulking, and furniture repair.
>
> An electrician, trained in both lighting and power.
>
> A mechanic, who also can work as a plumber and steamfitter.
>
> A painter, who also can glaze, putty, caulk, spackle, and perhaps lay asphalt and vinyl asbestos floors, install insulation around pipes, and who is familiar with most kinds of surface coverings and coatings.

The next additional staff would be a carpenter's helper, followed by a second mechanic. Adding another mechanic allows the department to divide pipe work into heating and cooling; for technical reasons, one man is seldom strong in both fields.

Other specialists needed, in order of descending importance, are a combination roof and sheetmetal mechanic, a mason, a machinist, and a welder.

Staff organization in small schools usually is fairly simple with individual tradesmen reporting directly to the director, buildings superintendent or possibly a shops foreman.

Samples of suggested organizational patterns are shown in Figures 3-1 and 3-2.

RECRUITING

Finding reliable and skilled tradesmen is difficult, especially in areas where educational institutions cannot match salaries offered by the construction industry. Chapter 1, Personnel Administration, offers some general recommendations on recruiting. Of those suggestions, the ones most pertinent to maintenance work are:

EXAMPLE OF ORGANIZATION FOR BUILDINGS MAINTENANCE & OPERATION

Hypothetical case No. 1.

200,000 Gross Sq. Ft. of building-Enrollment - between 500-1000 F. T. E. students
Complement _5_ to _7_ persons

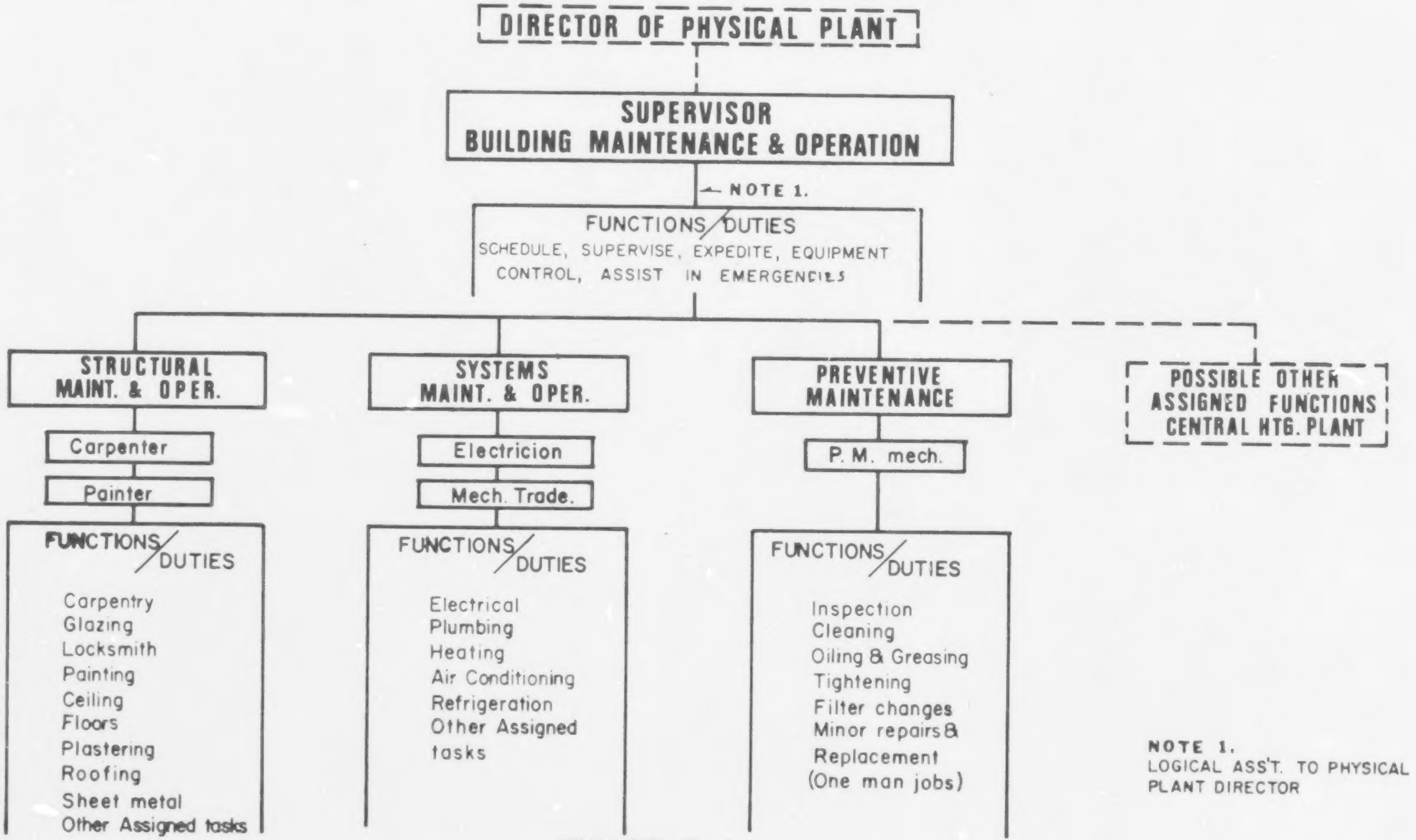

DIRECTOR OF PHYSICAL PLANT
SUPERVISOR
BUILDING MAINTENANCE & OPERATION
NOTE 1.
FUNCTIONS/DUTIES
SCHEDULE, SUPERVISE, EXPEDITE, EQUIPMENT CONTROL, ASSIST IN EMERGENCIES
STRUCTURAL MAINT. & OPER.
Carpenter
Painter
FUNCTIONS/DUTIES
Carpentry
Glazing
Locksmith
Painting
Ceiling
Floors
Plastering
Roofing
Sheet metal
Other Assigned tasks
SYSTEMS MAINT. & OPER.
Electricion
Mech. Trade.
FUNCTIONS/DUTIES
Electrical
Plumbing
Heating
Air Conditioning
Refrigeration
Other Assigned tasks
PREVENTIVE MAINTENANCE
P. M. mech.
FUNCTIONS/DUTIES
Inspection
Cleaning
Oiling & Greasing
Tightening
Filter changes
Minor repairs &
Replacement
(One man jobs)
POSSIBLE OTHER ASSIGNED FUNCTIONS CENTRAL HTG. PLANT
NOTE 1.
LOGICAL ASS'T. TO PHYSICAL PLANT DIRECTOR

FIGURE 3-1.

EXAMPLE OF ORGANIZATION FOR BUILDINGS MAINTENANCE & OPERATION

Hypothetical case No. 2.

500,000 Gross Sq. Ft. of buildings-Enrollment between 1000-1500 F.T.E. students
Complement 12 to 15 persons

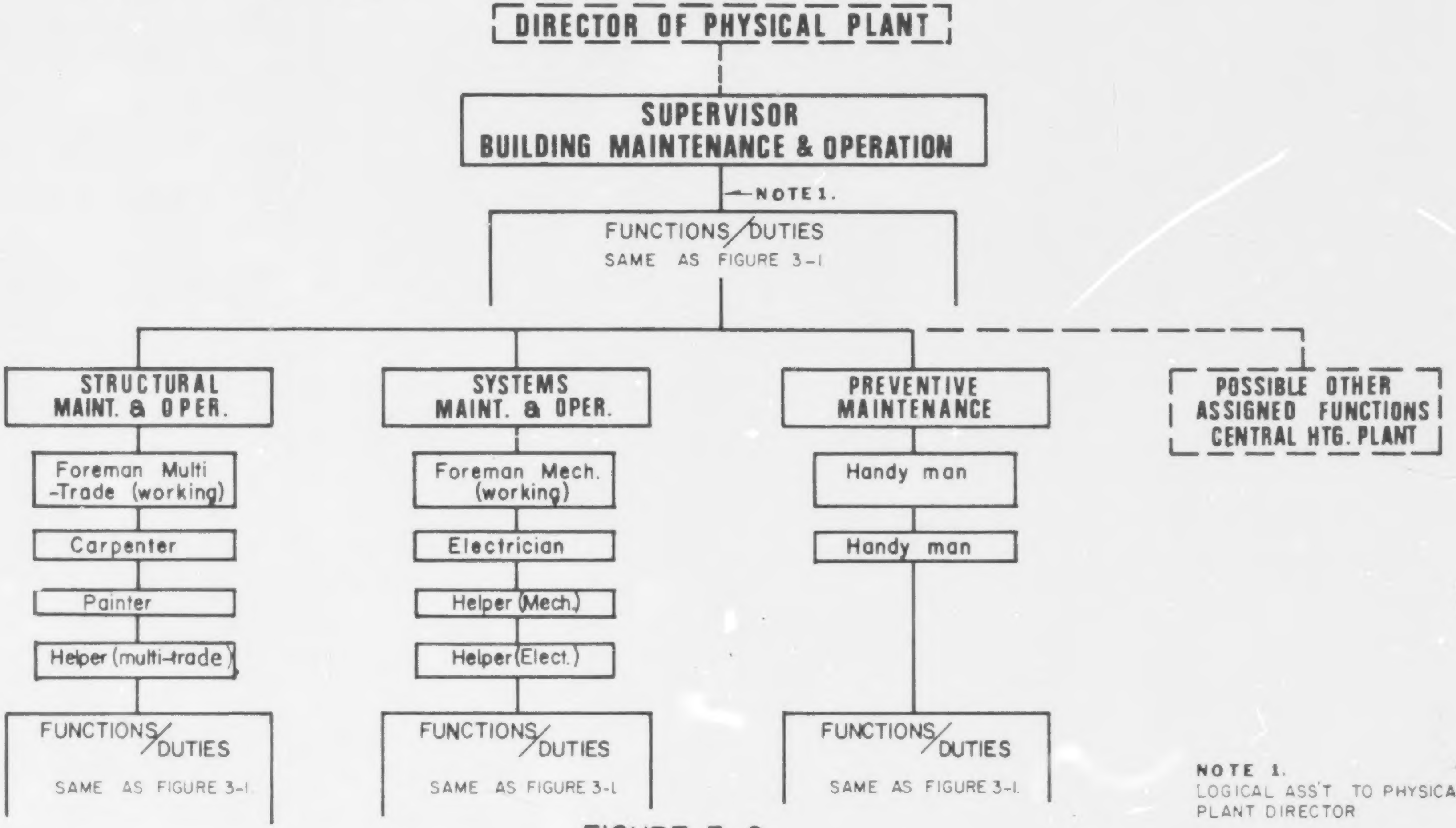

DIRECTOR OF PHYSICAL PLANT
SUPERVISOR BUILDING MAINTENANCE & OPERATION
NOTE 1.
FUNCTIONS/DUTIES SAME AS FIGURE 3-I
STRUCTURAL MAINT. & OPER.
Foreman Multi-Trade (working)
Carpenter
Painter
Helper (multi-trade)
FUNCTIONS/DUTIES SAME AS FIGURE 3-I.
SYSTEMS MAINT. & OPER.
Foreman Mech. (working)
Electrician
Helper (Mech.)
Helper (Elect.)
FUNCTIONS/DUTIES SAME AS FIGURE 3-I
PREVENTIVE MAINTENANCE
Handy man
Handy man
FUNCTIONS/DUTIES SAME AS FIGURE 3-I.
POSSIBLE OTHER ASSIGNED FUNCTIONS CENTRAL HTG. PLANT

FIGURE 3-2.

NOTE 1.
LOGICAL ASS'T TO PHYSICAL PLANT DIRECTOR

1. Promote from within, whenever possible. This tactic insures that the institution and applicant each know the other's strengths and weaknesses.

2. Ask staff personnel to recruit candidates. Staff tradesmen should be able to recommend qualified tradesmen in the area, and they would be unlikely to recommend men whose work would reflect poorly on them.

3. Recruit from the armed services. Their tradesmen are usually well trained in one skill and familiar with several others. Navy machinist mates, in particular, often have proved especially appropriate for the handyman work that prevails in plant maintenance.

4. Recruit from the construction industry. Although educational institutions can seldom match salaries paid in a high-growth area, they can offer certain compensating benefits such as year-round salaries, indoor work, and pleasant environment. Such benefits often are attractive to older tradesmen weary of working outdoors in rough weather.

TRAINING

Since few small schools are able to provide much formal training in skilled trades, most on-campus training comes from on-the-job association with more skilled personnel. To help upgrade employees all schools should, however, attempt some kind of formal training; at least, a monthly classroom session in which supervisors or senior men cover topics of general interest, such as blueprint reading and job estimating.

To further prepare employees for advancement, the school also should encourage participation in relevant off-campus programs. Many trade schools offer correspondence courses and evening sessions. Equipment manufacturers periodically provide short training courses covering maintenance, operation and repair of their products. The Association of Physical Plant Administrators regularly schedules workshops on aspects of plant maintenance.

The best ways to encourage employees to participate in such programs are to pay the tuition and travel expenses and to continue salaries during absences. One risk is that as men become better-trained they may move on to better-paying work. In return for training, however, the instituion might ask employees for a commitment to work for a reasonable period after training to enable the institution to recover its investment.

The BM&O division also should emphasize the importance of awareness of new methods and materials. To keep current on his trade, the employee should read trade magazines, newsletters, workshop papers, and building materials catalogs regularly. The physical plant director must make these conveniently available.

SHOPS AND TOOLS

Ownership of the hand tools tradesmen require to accomplish assigned tasks varies between institutions. Some schools issue all hand tools, usually on memorandum receipts to permanent employees, while others make employees furnish their own. This should be explained at time of employment.

As the institution grows, the maintenance force is refined from general purpose mechanics to specialty tradesmen. The development of small basic shops for the various trades, usually accompanies this growth. By encouraging recommendations on priority purchase of fixed equipment, a supervisor or director insures the future acceptance and usage as shop equipment is added.

Examples of equipment recommended for the four basic shops, carpentry, electrical, mechanical, and paint are described in Figure 3-3.

A SUGGESTED EQUIPMENT LIST FOR STARTING INDEPENDENT SHOPS

CARPENTRY SHOP

1. Tilting arbor saw, 12" w/25" max. rip to right of blade, base-mounted
2. Long bed joiner, 8"
3. Radial arm saw, 10"
4. 2-way panel saw
5. Wood cutting band saw, 14"
6. Drill press
7. Belt sander, 6"
8. Bench grinder
9. Jig saw, 24"
10. Floor shaper

ELECTRIC SHOP

1. Testing Equipment:
    a. Volt-amp ohmmeter, recording type
    b. "Megger"
    c. Tachometer
    d. Pipe and cable locator (electronic)
    e. Foot candle meter
2. Electric Motor Analyzer
3. Phasing tester (high & low voltage)
4. Pipe threaders
5. Pipe benders
6. Stud gun or hole shooter

PAINT SHOP

1. Extension ladders:
    a. 24'
    b. 40'
    c. 60' (if necessary)
2. Step ladders:
    a. 8'
    b. 6'
3. Paint spray equipment
4. Drop cloths
5. Paint can shaker
6. Adequate supply of brushes, rollers, pails and trays

MECHANICAL SHOP
(Plumbing, Steamfitting and Refrigeration)

1. Pipe machine for cutting and threading up to 2" with ratchet-drop head threaders
2. Sturdy bench with pipe vise
3. Pipe wrenches:
    a. 36"
    b. 24"
    c. 18"
4. Powered augur for clearing sewer stoppage
5. Bench grinder
6. Drill press, small
7. Oxygen/Acetylene cutting and soldering outfit
8. Prest-o-lite copper sweating tools
9. Portable sump pump for manholes

Figure 3-3.

CONTRACTORS

To suuplement its staff a BM&O division at a small school often must engage private contractors for:

1. Specialized work. Few small schools can afford full-time men trained for jobs such as welding a structural member, sandblasting an exterior wall or tuckpointing masonry. Because of greater specialization, research and experience, private contractors may be able to perform certain jobs more economically than in-house staff. Elevator maintenance is a common example.

2. Crash programs. Frequently BM&O must finish large jobs in a short period of time. Painting dormitories during semester breaks, or decorating the campus for commencement are occasional tasks that require more men than the division normally employs.

3. Emergencies. Flood, blizzard, fire, hurricane or riot also may require addition of numerous men with varied maintenance and repair skills. In most such cases, the physical plant department pays for the extra help out of its operating budget and then seeks reimbursement from its insurance carrier.

Although contract work often is a wise investment, certain disadvantages deserve mention. With private firms, the physical plant director has less control over the type of men working on campus, a fact which can cause additional security problems. An additional consideration: Contract workers are primarily committed to making a profit. They may, therefore, be less concerned than good staff personnel with doing the best possible work for the institution.

Keys to contracting work are:

1. Choose reliable firms. The low bidder may not always be the best man for the job, especially when the low bid cannot be traced to some economy methods. Check the firm's references, previous work and personnel, if possible.

2. Compile accurate specifications. For maintenance work, the director could take bids on lump sum or on time-and-material basis. Specifications should be reviewed yearly for weaknesses and revised when necessary. APPENDIX 3-A is a sample specification for exterior painting.

   For many recurring jobs such as roof repair, the director may want to keep a proven contractor on call. For such on-call work, the director should know in advance the contractor's charges, including his overhead and profit markup. On-call contracts often include an option to renew after negotiating an inflationary factor for the ensuing year. In no cases should the school slip into an open-ended arrangement with a private contractor.

3. Review the contractor's work. In some cases the director himself should inspect the work for compliance with the specifications. Usually in-house tradesmen perform inspections while work is in progress and approve the project before final payment is made.

4. Contract bidding and awards. These should be handled in such a way that fair competition is assured. Another office, such as business office or purchasing, should handle or participate in bid openings to guard against any charges of collusion or favoritism.

PREVENTIVE MAINTENANCE

The general purpose of preventive maintenance was discussed earlier--to find and fix equipment before it fails. Some of the specific returns of a well-organized program are: reductions in the number of large-scale repairs; amount of overtime emergency work; frequency of expensive, emergency purchases; and down time of equipment and facilities.

Organization is the key to realizing these benefits. Unfortunately, the growing popularity of preventive maintenance has led to oversimplification and misconception about procedures. Preventive maintenance means more than simply assigning men to wander through buildings listening to the equipment and looking for work to be done. Following is a discussion of the organization of essential elements of an effective program: work instructions, work inventory, work assignments, and basic records.

WORK INSTRUCTIONS

In general, preventive maintenance consists of inspecting, cleaning, lubricating, tightening, adjusting, and replacing worn or damaged parts where necessary. Tasks most frequently performed by preventive maintenance mechanics according to a survey at one large university were related to servicing:

- Air compressors
- Building surfaces, exterior and interior
- Closet doors
- Door hinges
- Drains
- Exhaust fans
- Fan belts
- Faucets
- Filters
- Hardware on doors, windows, bathrooms, etc.
- Light bulbs
- Light fixtures
- Locks
- Mechanical rooms
- Motors
- Pumps
- Shower valves
- Toilets

WORK INVENTORY

Job assignments at each school, of course, must be tailored to its buildings and equipment, their number, types and ages. To develop accurate job assignments and instructions, someone--the physical plant director or a preventive maintenance mechanic--must carefully inventory all preventive maintenance tasks.

One part of the preventive maintenance tasks inventory covers general maintenance jobs spelling out instructions such as:

> Inspect buildings in area and report all deficiencies you cannot correct to the work control desk.
>
> Keep mechanical rooms clean and orderly at all times.
>
> Tighten or adjust door closers and window locks and hinges.
>
> Keep areaways, stairwells and window-well drains clean and free of debris.
>
> Replace burned-out light bulbs and fluorescent tubes.
>
> Open clogged toilets and drains with plunger or hand augur. If fixture requires power augur or must be disassembled, report it to the work control desk.
>
> Repair leaking water faucets and shower heads.

Such jobs are not assigned according to a regular schedule but are done whenever a preventive maintenance mechanic discovers them during his rounds, or whenever a building occupant points them out. An important part of his rounds is a daily stop at the office of the senior administrator or academic department to pick up job requests turned in by building occupants. After inspecting the complaint the mechanic should either correct the problem himself or report it to the work control desk. To guide him, the preventive maintenance supervisor should stress the importance of not attempting jobs requiring considerable time, a high level of expertise or additional men. When the preventive maintenance mechanic reports the job to the work control desk, he should notify the complainant about any anticipated delay.

In addition to listing general maintenance projects, the work inventory must cover the wide variety of specific jobs necessary to properly maintain building systems in operating condition. Certain jobs would be done only when necessary, but most are assigned according to a regular schedule. This list, therefore, is the most important part of the work inventory, and the most difficult to compile.

To establish an equipment inventory, list all pieces of equipment in each building, review operating manuals provided by manufacturers, and identify all individual maintenance actions, their recommended frequencies, and any special instructions. The work list that results might include instructions such as:

1. Check all air filtering equipment weekly; clean when needed or replace filters.

2. Check all equipment requiring lubrication and lubricate when specified.

3. Clean and vacuum all finned coils found in fan coil units and air handling units.

4. Check fan belts weekly on all belt driven equipment and replace when necessary with specified size.

5. Read all gauges and thermostats daily and report abnormal readings to the work control desk.

WORK SCHEDULING

Organizing various jobs into a work schedule is one of the trickiest aspects of establishing a preventive maintenance program. Once the work inventory for equipment maintenance has been compiled, the main problem is integrating tasks into the daily and weekly work routines. While most preventive maintenance men can remember their normal tasks, few can be expected to remember such infrequent tasks as monthly valve testings, semiannual greasings and even annual parts cleaning or replacement.

Once jobs have been defined from equipment manuals, thereafter they should be filed for ready reference. Two filing techniques can prove especially helpful for prodding memories.

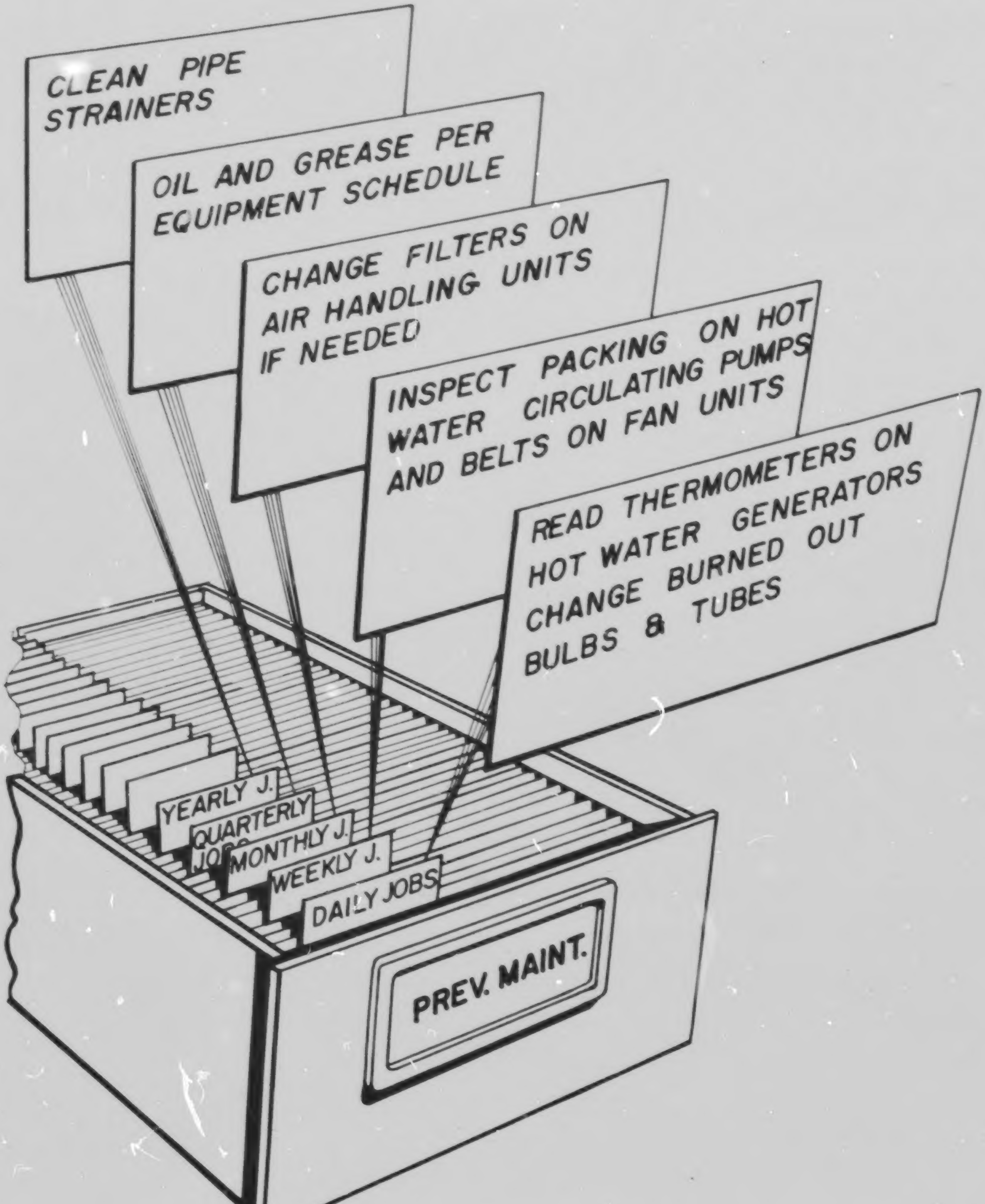
1. Tickler Tabs. This technique requires one card for each piece of equipment needing preventive maintenance. On the card, perhaps a 5" by 8", identify the equipment and its location and list each type of maintenance required along with the frequency recommended. Also note parts, lubrications and supplies needed. Next to each job, leave space to record the dates performed. To the top of the card attach a different colored tab for weekly, monthly, semiannual, and annual jobs. A sample file is shown as Figure 3-4. By checking this file regularly, the preventive maintenance mechanic can find when each job was done last and quickly decide when the next one is due.

2. Color-coded Cards. This alternative requires a different color card for weekly, monthly, semiannual, and annual work. Each card explains a particular job for a particular piece of equipment and includes cross-references to all other work needed. More cards are required under this system, but each would have more room for listing important data, parts and supplies, and for recording dates of work done.

To supplement color-coded files, the preventive maintenance man can use floor space diagrams and campus maps to further organize his work routine. On the maps and diagrams of his work area, he can note all his major equipment maintenance jobs, using a color code that complements the file system.

With coded diagrams and job lists in front of him, the preventive maintenance mechanic can then work out the most time-saving routes to follow on different days. Since many jobs are not done daily, at a minimum, several routes would be necessary. In one building, for example, he might check certain floors only once a week while inspecting the mechanical room daily. If special work requests occur frequently enough, he might develop a different route every day.

Even though his routes vary frequently, time spent mapping the best route is still time well spent. Such planning saves wasted steps and reminds the preventive maintenance man to carry appropriate tools and supplies with him.



CLEAN PIPE STRAINERS
OIL AND GREASE PER EQUIPMENT SCHEDULE
CHANGE FILTERS ON AIR HANDLING UNITS IF NEEDED
INSPECT PACKING ON HOT WATER CIRCULATING PUMPS AND BELTS ON FAN UNITS
READ THERMOMETERS ON HOT WATER GENERATORS CHANGE BURNED OUT BULBS & TUBES
YEARLY J.
QUARTERLY JOBS
MONTHLY J.
WEEKLY J.
DAILY JOBS
PREV. MAINT.

TICKLER FILE FOR PREVENTIVE MAINTENANCE MECH.

FIGURE 3-4.

PREVENTIVE MAINTENANCE PERSONNEL

It should be clear by now that preventive maintenance personnel should possess a variety of skills and character traits. Ideally, mechanics will come from a broad, multitrade background and bring with them abilities for analyzing equipment breakdowns, estimating work, coping with emergencies, and understanding operating instructions for complex electrical and mechanical equipment. Most importantly, they should be reliable self-starters, men who can be trusted to work on their own and perform competently. They should also recognize their own limitations and not attempt jobs requiring excessive time, greater skill or more men.

Finding such men is not easy, training them is difficult and keeping them is even more difficult, especially when skilled tradesmen generally command higher salaries and greater esteem. Some schools, therefore, have tried to upgrade the job by establishing a separate classification for preventive maintenance mechanics and paying good men what they deserve. Orchestras usually pay higher salaries to musicians talented enough to play several instruments well. Why shouldn't physical plant departments do the same?

WORK ASSIGNMENTS

For assigning preventive maintenance work, two methods are widely used: Zone Maintenance and Team Maintenance. Since the advantages of each offset the disadvantages of the other, many schools combine these approaches.

Zone Maintenance

Under this option, one man basically is responsible for a clearly defined area. One school, for instance, assigns each man 14 to 18 buildings, several others assign a maximum of 200,000 gross square feet of building floor space per preventive maintenance mechanic. The appropriate assignment depends upon the conditions at each campus. In each zone the preventive maintenance mechanic sets up a small shop where he keeps buildings plans, manuals, records, tools, and frequently-used parts and supplies.

His major tasks are those enumerated earlier: inspecting, cleaning, lubricating, adjusting, and making small repairs--duties which usually blend together on the job site. To guide his work, he uses the equipment job inventory described earlier.

The advantages of the zone method are: thorough coverage, early discovery of developing problems, and on-the-spot repairs that save unnecessary paperwork and travel time. The zone maintainer becomes the resident expert familiar with the problems and peculiarities of the areas, its equipment and its occupants. One result is flexibility--he can schedule his work around special projects and unusual working hours to avoid conflict with academic and research programs. Another important benefit is psychological motivation--a man carrying complete responsibility for a specific area usually develops pride in his performance.

The major disadvantage to Zone Maintenance stems from the limitations inherent in a man working alone. If he cannot unstop a toilet with a plunger or hand augur, he must call in a crew or contractor with a power tool. Although he can tighten door closers to prolong their lives, he must call on a carpenter with shop tools when closer repairs are necessary. He can replace most light bulbs but not ceiling lights in auditoriums and gymnasiums. Such work requires extra men with high ladders and special equipment.

Team Maintenance

Some schools avoid the limitations inherent in the zone method by using the team approach. In this system, a crew combines to cover a large area. In a small school the area might include the whole campus. In a sense, an area is simply a larger zone and the team leader is the zone maintainer. It is the team leader or supervisor who is the key to success of this approach. He must spend most of his time organizing the preventive maintenance work: inspecting, making job lists, ordering parts and supplies, assigning men, and reviewing their work.

Team maintenance allows a different type of flexibility. Because of their number, a team can accomplish more jobs than a single man. Under a good supervisor, however, only the necessary number of men would handle each job; in some cases everyone on the team might work alone to handle individual assignments if no large jobs are scheduled. Further flexibility comes from the ease with which a team covers absences due to sickness, holidays and vacations.

Complications attend this option, however. Because they cover such a large area, team members may not become as familiar with the territory and its troubles as the single mechanic might. Team coverage makes pinpointing responsibility for unsatisfactory performance more difficult. The final disadvantage is economic: Many small maintenance and repair jobs do not require two or more men, and featherbedding can occur, even under the best supervisor.

PREVENTIVE MAINTENANCE SHOP

Under both Zone and Team Maintenance, a small shop serving as base of operations for mechanics is recommended for each major area of the campus. Often these are located near mechanical rooms of large buildings, and usually are stocked with the following:

Equipment Operating and Maintenance Manuals available from manufacturers.

Technical Drawings, preferably including the "as-built" architectural, structural, electrical, and mechanical prints for each building in the area.

Records, both inventories of equipment and preventive work to be done and logs of work completed.

Supplies, primarily a small stock of parts and materials most frequently used.

Tools, especially those usually found in the preventive maintenance mechanic's kit.

Tool Kit

The basic tools a preventive maintenance man should have access to include:

1 Set Allen Wrenches
1 Broken Bulb Extractor
1 Bulb Stick and Head
1 Drill, Electric, 3/8"
1 Set Drill Bits
1 File, 10"
1 Flash Light
1 Fuse Puller
1 Grease Gun
1 Hammer, Carpenter
1 Hack Saw
2 Ladders, Aluminum, Folding
1 Oil Can

(continued on next page)

1 Pair Pliers, Channel Lock, 12"
1 Pair Pliers, Electrician
1 Pair Pliers, Needle Nose
1 Rule, 6'
1 Set Screw Drivers, 4 sizes
1 Screw Driver, Offset
1 Screw Driver, Phillips
1 Test-O-Lite
1 Toilet Augur
1 Toilet Plunger
1 Tool Pouch
1 Vise, Bench Type
1 Water Key, 4 way
1 Wrench, Basin
1 Wrench, Pipe, 10"
1 Wrench, Pipe, 14"

RECORDS

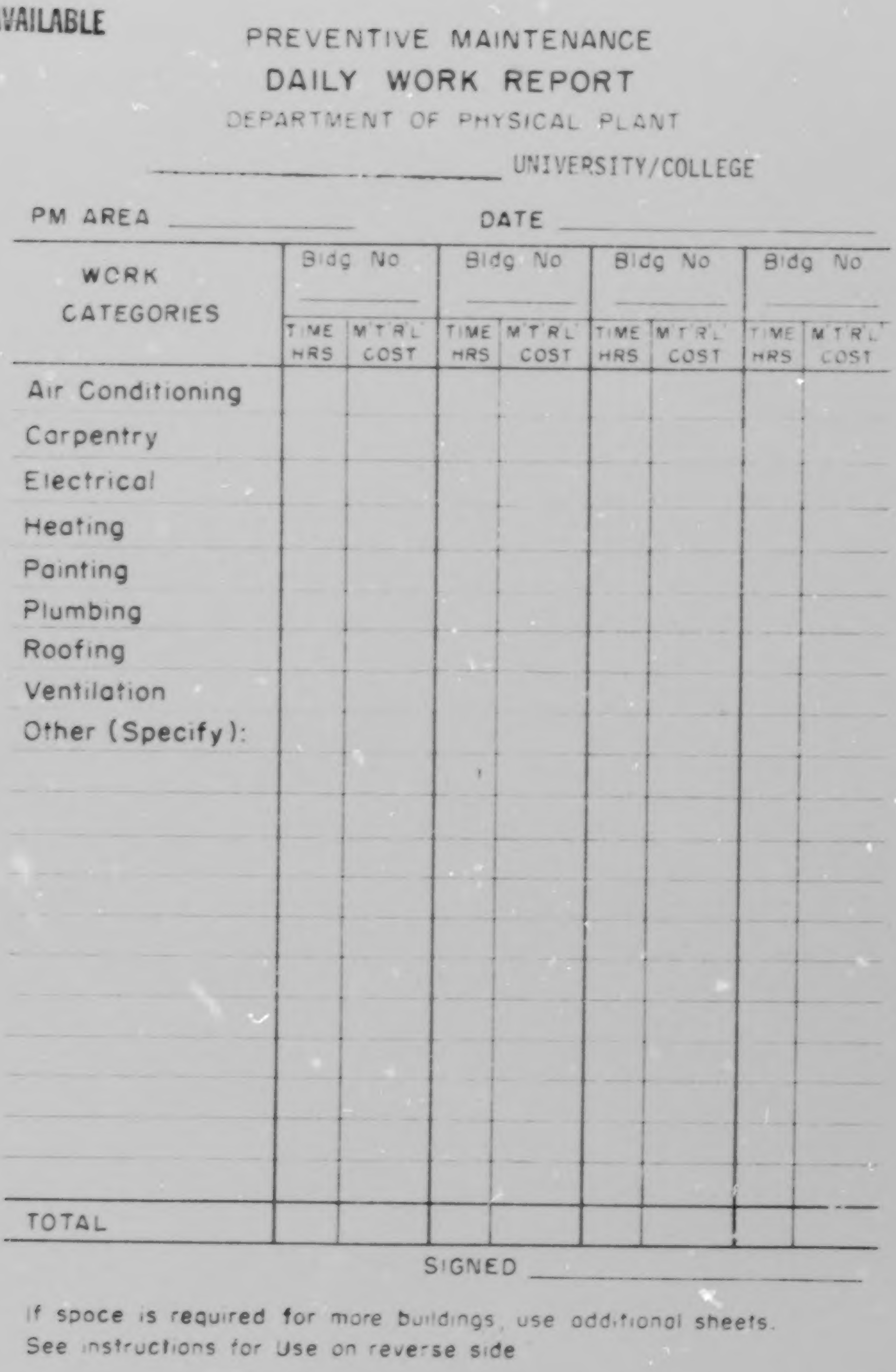
In addition to keeping equipment and work inventories and work schedules, the maintenance mechanic should maintain concise daily records of all work completed for each piece of equipment. Major equipment jobs should be noted in two places--on a dated tag attached to the equipment and on the inventory record kept in the maintenance shop. These records, if properly kept, complete a work history for all equipment in the area.

Maintenance personnel also should post-report all work into the department's work control system. Figure 3-5 shows a form for reporting work time expended and materials used. In the time consumption charged to each job, the mechanic includes time allowed for planning, ordering supplies, travel, clean-up, and record keeping--a "portal-to-portal" approach. Since maintenance workers also use time for planning, tool care, record keeping, coffee breaks, resupply and the like, a shop time allowance of perhaps 15% of the work day generally is acceptable.

WORK ORDER SYSTEM

The heart of an effective buildings maintenance and operations program is the work order system which receives all work requests, initiates action and follows the project through to completion. Without well-organized work order control, many varied maintenance tasks would not begin promptly, be completed properly or be accurately recorded. Quicker response, greater efficiency, smoother coordination and better records for long-range planning result from an effective work order system. Administrative processes such as scheduling, estimating, coordinating, supervising and record keeping contribute to a well-planned system.

BEST COPY AVAILABLE



PREVENTIVE MAINTENANCE
DAILY WORK REPORT
DEPARTMENT OF PHYSICAL PLANT

________________ UNIVERSITY/COLLEGE

PM AREA ____________ DATE ________________

WORK CATEGORIES	Bldg No ____		Bldg No ____		Bldg No ____		Bldg No ____	
	TIME HRS	M'T'R'L COST	TIME HRS	M'T'R'L COST	TIME HRS	M'T'R'L COST	TIME HRS	M'T'R'L COST
Air Conditioning								
Carpentry								
Electrical								
Heating								
Painting								
Plumbing								
Roofing								
Ventilation								
Other (Specify):								
TOTAL								

SIGNED ________________

If space is required for more buildings, use additional sheets.
See instructions for Use on reverse side

Figure 3-5. Daily Work Report

BEST COPY AVAILABLE

INSTRUCTIONS FOR USE

1. This form is to be completed and turned in to the Preventive Maintenance Superintendent in the Service Building at the end of each working day.

2. The number of each building worked in should be shown along with the hours required in each trade. Do not fill in material costs; these columns will be completed by the Plant Maintenance Office staff. Total number of hours worked should be accounted for—usually eight (8). Account only for work performed by you individually.

3. All materials used in each building shall be listed daily on a "Stock Issue Ticket", PM&O Form #12, and all tickets attached to this report.

4. All time must be accounted for, including time used for "shop work".

5. If work arises which is beyond your capability or on which you need assistance, complete the "Work Order Request", PM&O Form #66, and turn in to the Preventive Maintenance Superintendent in the Service Building, along with your Daily Work Report, PM&O Form #65.

6. Should you find fire or safety hazards in your buildings, call the Safety Section.

7. Under "Other" categories, list time taken for vacation or sick leave, shop time, other trades not listed.

Reverse side Figure 3-5.

Daily Work Report

WORK CONTROL DESK

To coordinate an effective work order system, a large university would have a work control center; a small university would assign this duty to a clerk or to the secretary to the physical plant director as a part-time assignment. It is important to designate a person and place for receipt of work requests and occupant complaints. The campus should be aware of the trouble telephone number for reporting maintenance problems.

WORK REQUEST FORM

Work requests come from a variety of sources: building occupants, custodial personnel, security officers, tradesmen, and preventive maintenance mechanics. In a well-managed physical plant department, most requests should come from department employees trained to spot and report problems during normal work rounds. Such training helps the department keep on top of maintenance problems and frees faculty and administrators to concentrate on educational functions.

Nevertheless, work request forms should be distributed to all major administrative, academic and staff offices to facilitate maintenance requesting. A properly designed form such as the one shown in Figure 3-6 also aids the complainant in supplying complete and accurate information, data essential for analyzing the request and issuing a work order. Request forms serve as a reminder that the physical plant department carries responsibility for handling maintenance problems.

Although some small institutions combine the work request form with the work order form in hopes of reducing paperwork, several inherent shortcomings work against this attempted economy. The first drawback is improperly described work, and the second involves complex work requiring several trade crews and compound work orders.

When, despite distribution of forms, work requests come to the work control desk via telephone, the work order clerk can use well-designed forms to extract from the complainant all pertinent information. With practice, the clerk can analyze the problem by translating the layman's description into the vocabulary of the foremen and tradesmen.

Analysis is important because work requests need not automatically become work orders. In cases where the request is a familiar one and the job elements are simple tasks with clearly established time standards, the clerk can quickly estimate time, assign work order numbers and work them into the maintenance schedule. If questions remain about the nature and extent of a job, a foreman must do a quick reconnaissance and analysis to decide whether the request should be rejected or accepted. This final decision on the request should be noted in the bottom section titled "Disposition."

WORK ORDER FORM

When a request is accepted as a valid job order, the clerk or foreman assigns a number and completes a work order form. The number is, of course, one of the key elements in the whole system. It follows the job through scheduling, completion and final recording. It also serves as the means for collecting all cost elements for any particular job. Some institutions use a coded number in which different digits serve to identify different functions. One number may indicate priority, one the department responsible and another the chronological sequence within the department. For a small college, however, a simple chronological sequence should suffice for all jobs. Each new work order simply receives the next number, regardless of priorities or departments involved.

The work order is the most important piece of formal paper in the work order system. This document officially authorizes the work, analyzes and estimates it in more detail, and serves as the vehicle for coordinating various tasks and collecting cost elements. The more complete the work order form, the more useful it will be.

A variety of effective formats is possible. Figures 3-7, 3-8 3-9, 3-10, 3-11, and 3-12 show numerous options to consider. Any form is acceptable that incorporates the elements essential to initiating and following through simple and complex tasks.

________________ UNIVERSITY/COLLEGE

Date ________________
Time ____________

SUBJECT: WORK REQUEST

TO: PHYSICAL PLANT DEPARTMENT

LOCATION: BUILDING NAME and/or NUMBER ________________

Room No. or Area ____________ ____________

REQUESTED BY: ________________________________
Name

Department: ________________ Phone ____________

DESCRIPTION OF DESIRED WORK: ________________
____
____
____
____

Special Instructions: ________________________________
____

RECEIVED BY: ____________ Date ____________ Time ____________

DISPOSITION: Action 1, 2 or 3

For Physical Plant ONLY: ADDITIONAL WORK ORDERS	
TRADE	W.O.

1. WORK ORDER # ________________ written
2. Assigned to Prev. Maint. ____________
Date
3. Returned to requesting department with explanation ________________
Date

Orig - Phy pl
Dup - Requesting Office

Figure 3-8.

Essential elements of a work order form include:

1. INPUT

   Sequential work order number.

   Date of the request and, for emergencies, the time.

   Location by building, by floor and by room; if exterior, details of area.

   Name of complainant and a telephone number where he can be contacted for further information.

   Name of the individual taking request.

2. EVALUATION AND APPROVAL

   Detailed description of work to be performed in terminology familiar to tradesmen.

   Priority assignment as an emergency, routine or standing work order.

   Identification of the funding as either physical plant department maintenance or charge-back services provided for another department. This item should list the exact account number.

   Assignments to the appropriate trade crews. If more than one crew is necessary, coordination between crews should be explained and separate work orders written for each.

   Materials and labor estimate. (Often this item is filled out only on the work order form retained by the work control clerk for setting up the work order backlog and comparing preliminary estimates with final costs.)

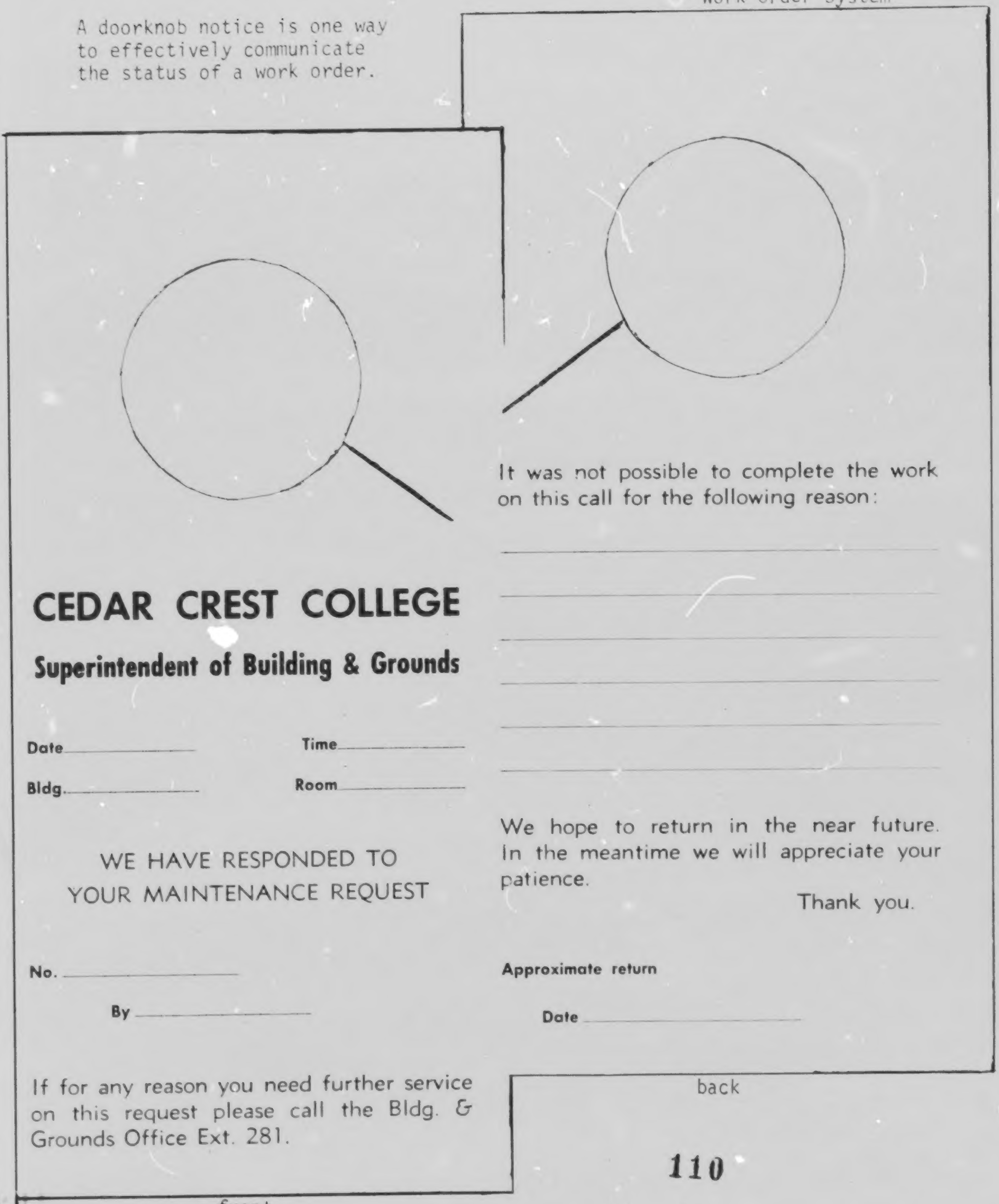
3. IMPLEMENTATION

   Tabulation of actual man hours spent and materials, parts and supplies used.

   Names of workmen who completed task.

   Report by responsible tradesmen of any further work requiring other trade specialties.

A doorknob notice is one way to effectively communicate the status of a work order.



CEDAR CREST COLLEGE

Superintendent of Building & Grounds

Date______ **Time**______
Bldg.______ **Room**______

WE HAVE RESPONDED TO
YOUR MAINTENANCE REQUEST

No. ______

By ______

If for any reason you need further service on this request please call the Bldg. & Grounds Office Ext. 281.

front

It was not possible to complete the work on this call for the following reason:

______
______
______
______
______
______

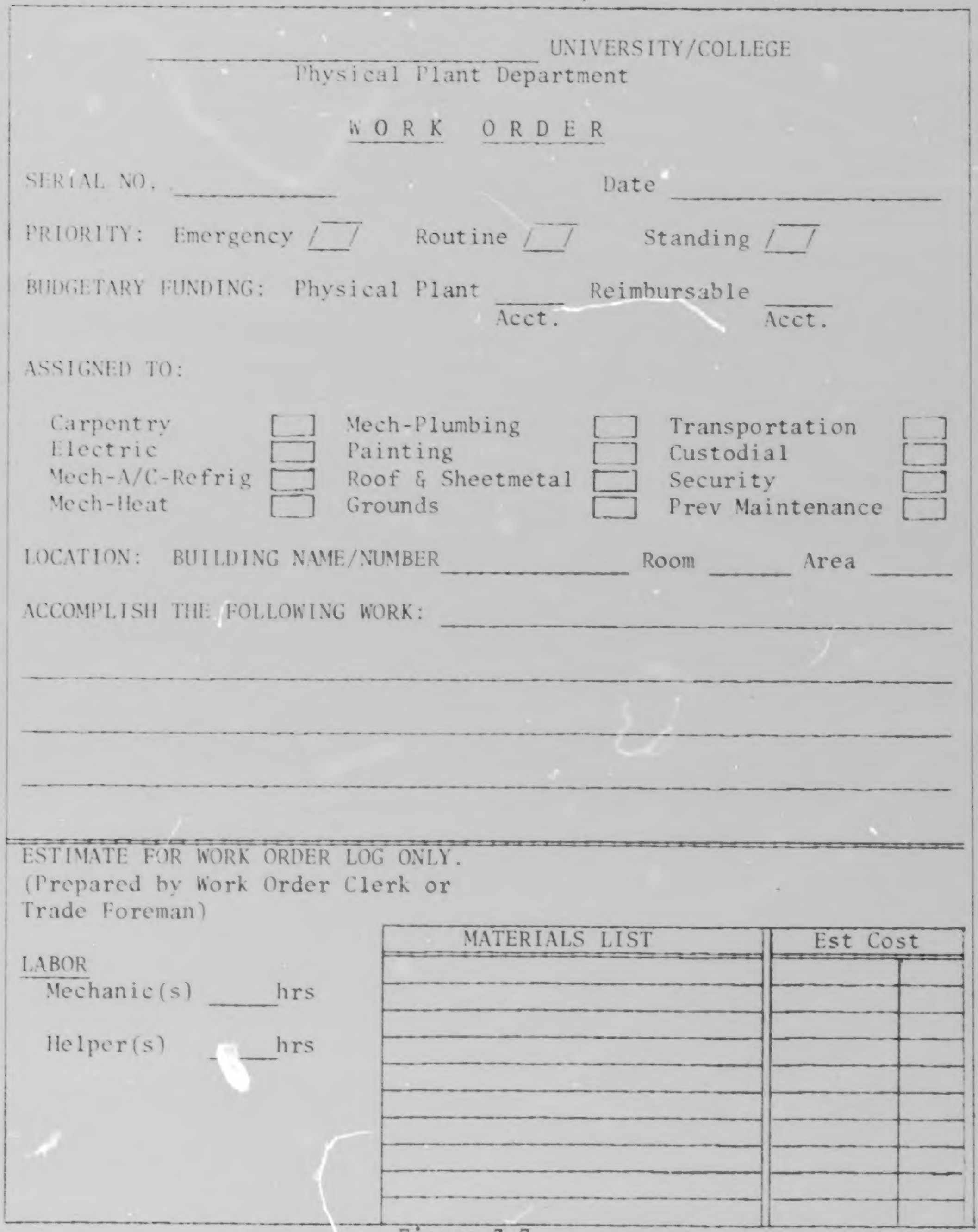
We hope to return in the near future. In the meantime we will appreciate your patience.

Thank you.

Approximate return

Date ______

back



________________________ UNIVERSITY/COLLEGE
Physical Plant Department

WORK ORDER

SERIAL NO. __________ Date ________________

PRIORITY: Emergency ☐ Routine ☐ Standing ☐

BUDGETARY FUNDING: Physical Plant ____ Acct. Reimbursable ____ Acct.

ASSIGNED TO:

- Carpentry ☐
- Electric ☐
- Mech-A/C-Refrig ☐
- Mech-Heat ☐
- Mech-Plumbing ☐
- Painting ☐
- Roof & Sheetmetal ☐
- Grounds ☐
- Transportation ☐
- Custodial ☐
- Security ☐
- Prev Maintenance ☐

LOCATION: BUILDING NAME/NUMBER ____________ Room _____ Area _____

ACCOMPLISH THE FOLLOWING WORK: ______________________________

____

____

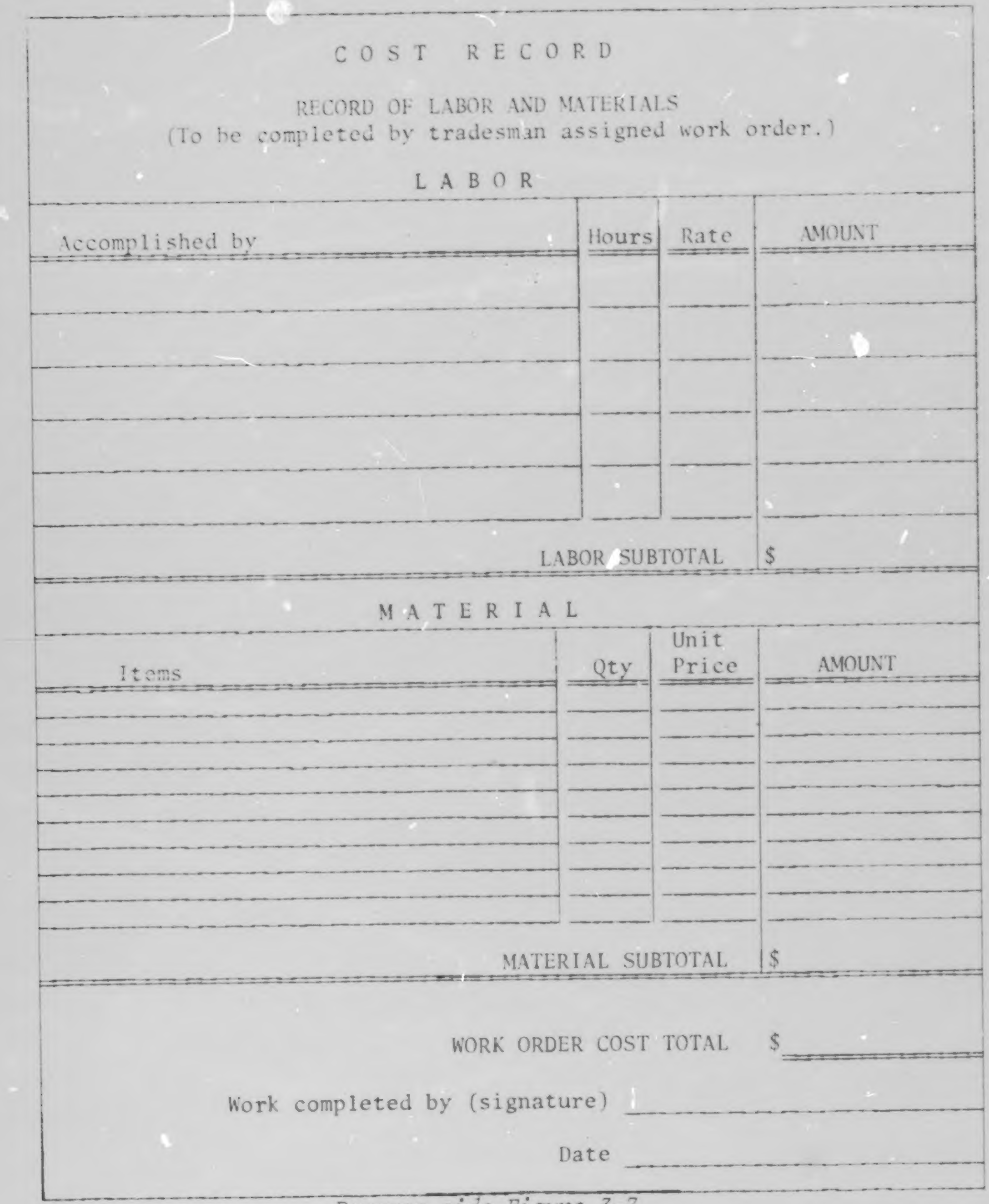
____

ESTIMATE FOR WORK ORDER LOG ONLY.
(Prepared by Work Order Clerk or
Trade Foreman)

LABOR
Mechanic(s) ____hrs
Helper(s) ____hrs

MATERIALS LIST	Est Cost	

Figure 3-7.



C O S T   R E C O R D

RECORD OF LABOR AND MATERIALS
(To be completed by tradesman assigned work order.)

L A B O R

Accomplished by	Hours	Rate	AMOUNT
		LABOR SUBTOTAL	$

M A T E R I A L

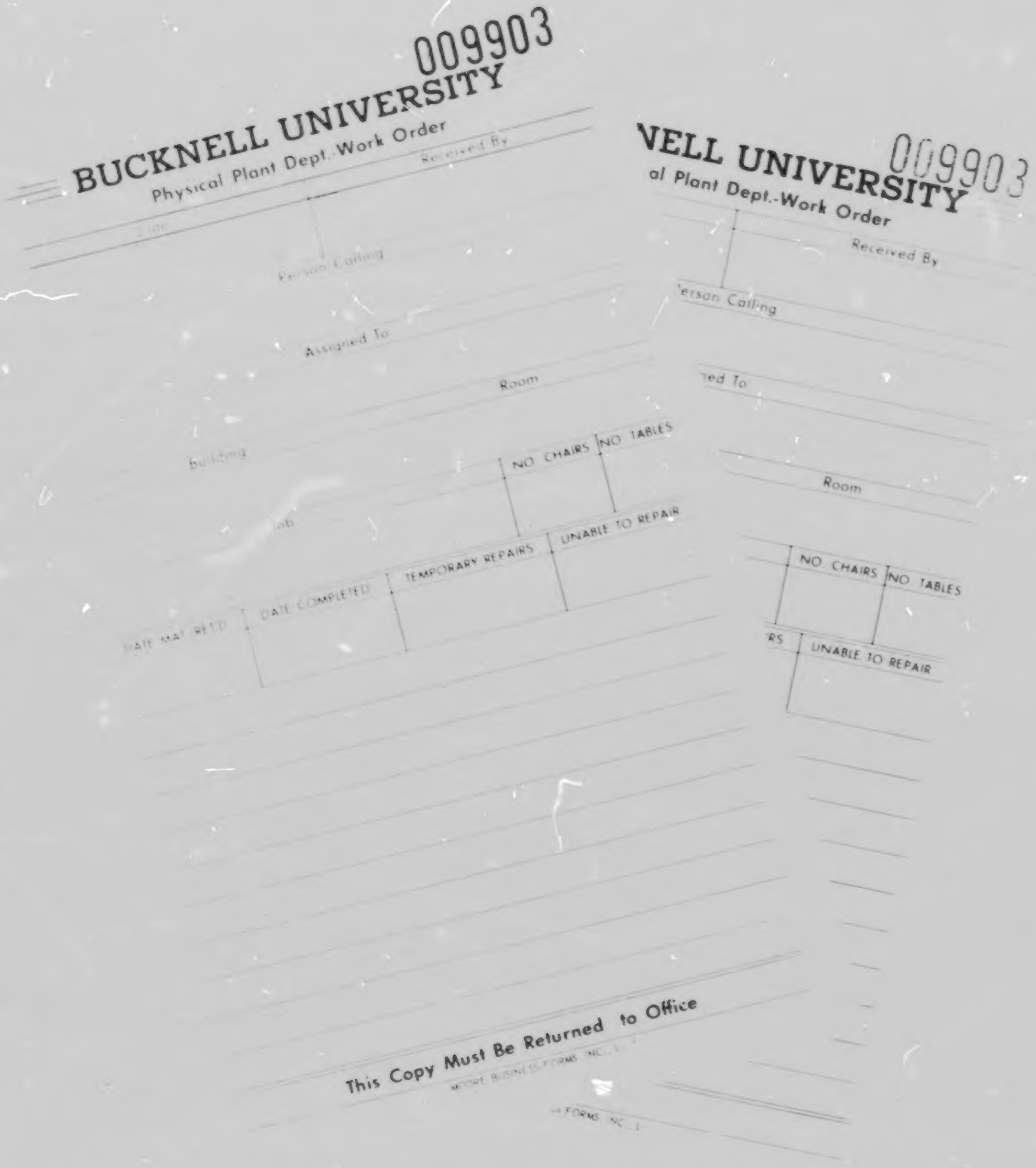
Items	Qty	Unit Price	AMOUNT
		MATERIAL SUBTOTAL	$

WORK ORDER COST TOTAL $ ____________

Work completed by (signature) ____________

Date ____________

Reverse side Figure 3-7.



009903

BUCKNELL UNIVERSITY

Physical Plant Dept.-Work Order

Date

Received By

Person Calling

Assigned To

Building

Room

Job

NO CHAIRS	NO TABLES

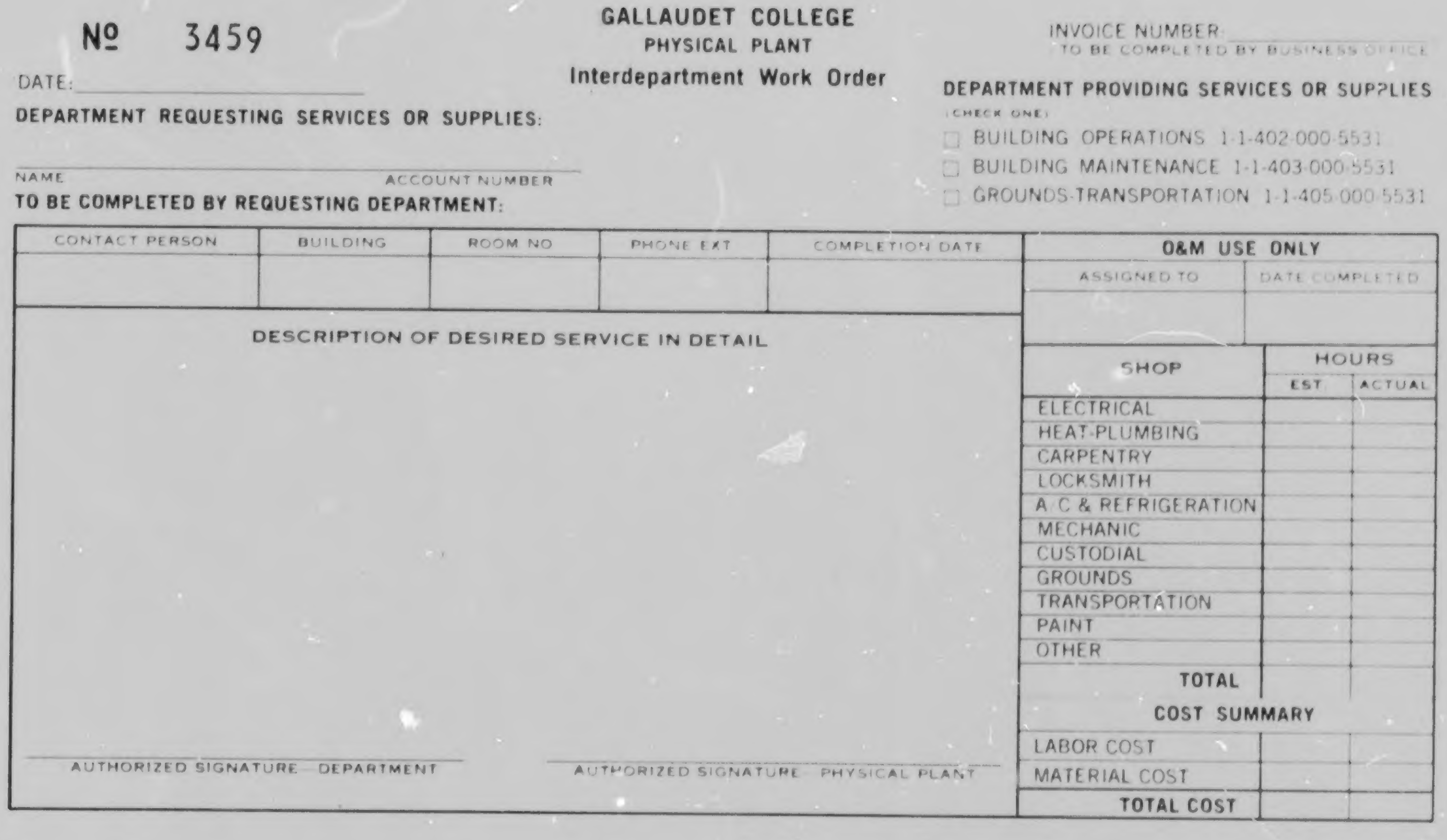
DATE MAT REQ'D	DATE COMPLETED	TEMPORARY REPAIRS	UNABLE TO REPAIR

This Copy Must Be Returned to Office

MOORE BUSINESS FORMS INC.

NELL UNIVERSITY
009903
al Plant Dept.-Work Order
Received By
erson Calling
ned To
Room
NO CHAIRS
NO TABLES
RS
UNABLE TO REPAIR
FORMS INC.

Figure 3-8.



№ 3459

GALLAUDET COLLEGE
PHYSICAL PLANT
Interdepartment Work Order

INVOICE NUMBER: ____________
TO BE COMPLETED BY BUSINESS OFFICE

DATE: ____________

DEPARTMENT REQUESTING SERVICES OR SUPPLIES:

NAME ____________ ACCOUNT NUMBER ____________

TO BE COMPLETED BY REQUESTING DEPARTMENT:

DEPARTMENT PROVIDING SERVICES OR SUPPLIES
(CHECK ONE)
☐ BUILDING OPERATIONS 1-1-402-000-5531
☐ BUILDING MAINTENANCE 1-1-403-000-5531
☐ GROUNDS-TRANSPORTATION 1-1-405-000-5531

CONTACT PERSON	BUILDING	ROOM NO	PHONE EXT	COMPLETION DATE

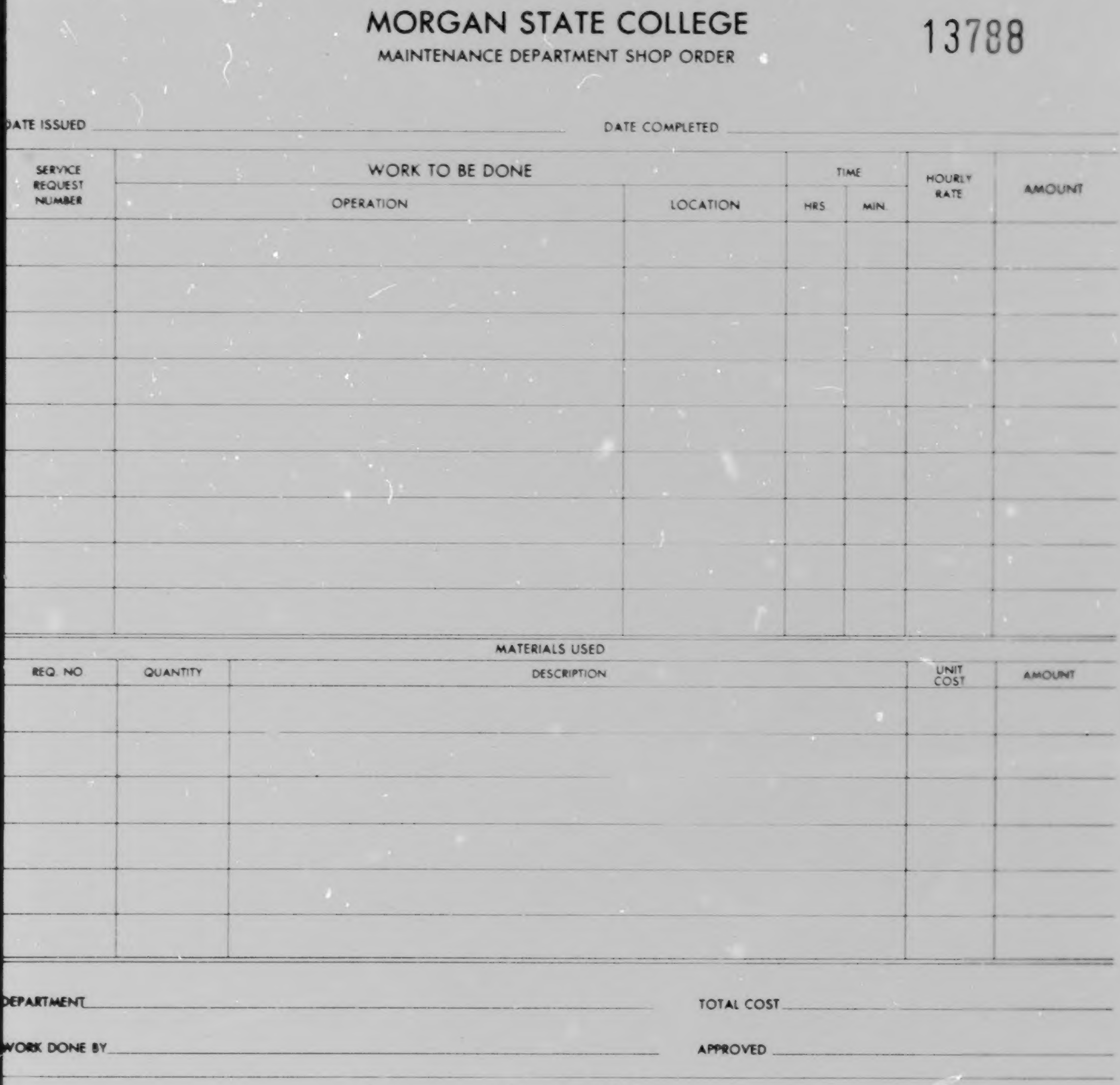
DESCRIPTION OF DESIRED SERVICE IN DETAIL

AUTHORIZED SIGNATURE—DEPARTMENT ____________

AUTHORIZED SIGNATURE—PHYSICAL PLANT ____________

O&M USE ONLY		
ASSIGNED TO	DATE COMPLETED	
SHOP	HOURS	
	EST	ACTUAL
ELECTRICAL		
HEAT-PLUMBING		
CARPENTRY		
LOCKSMITH		
A/C & REFRIGERATION		
MECHANIC		
CUSTODIAL		
GROUNDS		
TRANSPORTATION		
PAINT		
OTHER		
TOTAL		
COST SUMMARY		
LABOR COST		
MATERIAL COST		
TOTAL COST		

Figure 3-9.



MORGAN STATE COLLEGE

MAINTENANCE DEPARTMENT SHOP ORDER

13788

DATE ISSUED ______________________ DATE COMPLETED ______________________

SERVICE REQUEST NUMBER	WORK TO BE DONE		TIME		HOURLY RATE	AMOUNT
	OPERATION	LOCATION	HRS.	MIN.		

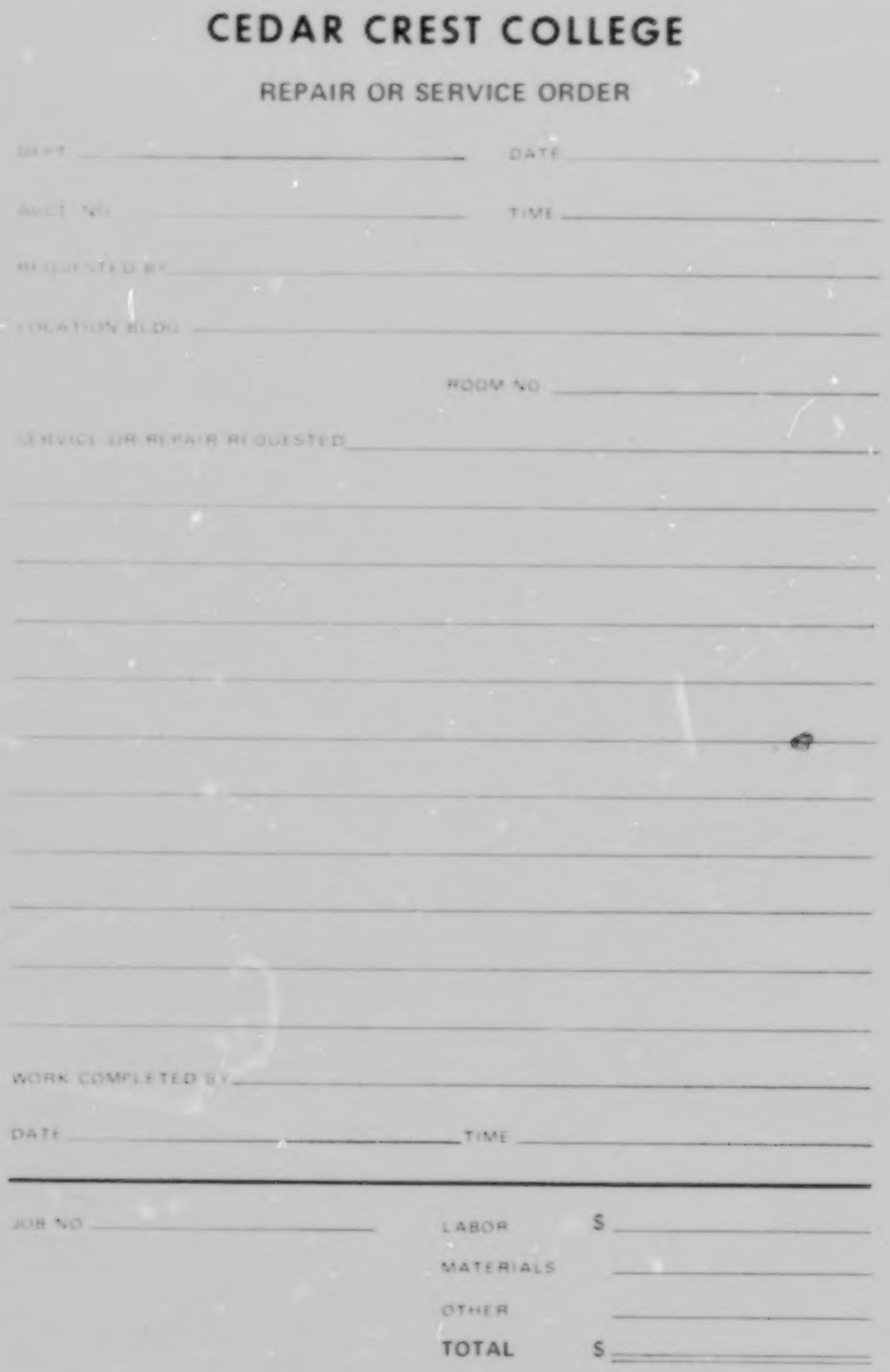
MATERIALS USED

REQ. NO.	QUANTITY	DESCRIPTION	UNIT COST	AMOUNT

DEPARTMENT ______________________ TOTAL COST ______________________

WORK DONE BY ______________________ APPROVED ______________________

Figure 3-10.



CEDAR CREST COLLEGE

REPAIR OR SERVICE ORDER

DEPT ______________________ DATE ______________________

ACCT NO ______________________ TIME ______________________

REQUESTED BY ______________________

LOCATION BLDG ______________________

ROOM NO ______________________

SERVICE OR REPAIR REQUESTED ______________________

WORK COMPLETED BY ______________________

DATE ______________________ TIME ______________________

JOB NO ______________________

LABOR $ ______________________

MATERIALS ______________________

OTHER ______________________

TOTAL $ ______________________

Figure 3-11.

BEST COPY AVAILABLE

MORAVIAN COLLEGE
Buildings and Grounds - Work Order

LOCATION: ______________________ ROOM-AREA: ______________________

DATE PREPARED: A B C DATE ASSIGNED:

CRAFT			DESCRIPTION - QUANTITY - MATERIAL	EST. HRS.	ACT. HRS.	DATES WORKED
CARPENTER						
ELECTRICIAN						
LOCKSMITH						
PAINTER						
PLUMBER						
GEN. MAINT.						
SOUTH CAMPUS						
DELIVERY						
GROUNDS						
MAILMAN						
					W/O NO.	

PREPARED BY: COMPLETED BY:

☐ Check here and then list on other side trades needed to complete job and/or equipment or trash to be removed.

Figure 3-12.

There should be at least two copies of the work order, one of which goes with the workman assigned the task. On this form he notes the hours spent and records or attaches receipts for the materials, parts and supplies used. Upon completion, the tradesman returns his copy to the work control clerk.

The second copy remains with the clerk until the workman's copy returns. From the work copy, the clerk compiles all the costs involved--labor, materials and overhead. The clerk then compares the actual totals with the estimates on his form, notes any significant discrepancy, slips the two forms together, and files them in the historical file for the building involved. In some schools periodic reports of work accomplished are required by supervisors.

This historical cost file is one advantage of the work order system. From these records planners can project maintenance costs for the next year on a cost-per-square-foot basis. This also aids projecting operating and maintenance unit costs for new buildings in the planning stage.

ESTIMATING

Another major advantage of the work order system is more accurate time estimates for future work orders. An organized approach to estimating requires analyzing each problem according to its basic job elements and assigning a time value for each element. Theoretically, the sum of these values gives the total time estimate. A highly sophisticated approach involves further analyzing the elements into work units and applying internally established work standards for each unit.

Estimating at a small school, however, often begins with informal "guesstimates" by the work order clerk. At this stage the clerk must rely heavily on the experience and general advice of the maintenance foremen and workmen. To set up the first, rough time standards for work units, he might utilize maintenance manuals developed by the United States Army, Navy and Air Force.

As historical records accumulate, however, via the work order system, internal work standards can be developed to replace personal intuitions and national standards. With a standards list such as the ones shown in Figure 3-13, a capable clerk can quickly and accurately estimate the time requirements for the majority of jobs.

The importance of developing internal work standards cannot be overemphasized. National standards are always crude averages that account for wide variations in productivity and working conditions. Although they may be helpful for a start and for comparison with in-house work rates, they should be replaced as soon as a substantial historical file is accumulated.

PRIORITIES

Priorities should be as nonpolitical and nonpartisan as possible. The most effective safeguard against bias and favoritism is a clearly defined priority policy that can be readily understood and easily interpreted by everyone--clerk, complainant, foreman and tradesman. At least two or at the most, three, priority classes are needed:

1. Emergency. Problems that create safety hazards, interrupt buildings operations, or seriously disrupt academic, administrative, or residential life take preference over all other work. Ruptured water mains, backed-up sewers or electric outages require immediate repair

2. Routine. Problems less serious than emergencies are slotted into the work schedule on a first come, first served basis. With leaking roofs or malfunctioning air conditioners, it may be practical to delay repair so the regular schedule or preventive work can continue as scheduled

3. Standing. A catch-all category is necessary for (a) shop time work not easily assignable to specific work orders, and (b) seasonally recurring jobs that can be performed to level peaks and valleys in the workload schedule.

SAMPLE LABOR ESTIMATING GUIDE FOR WORK ORDERS

_______________________________ College
PHYSICAL PLANT DEPARTMENT

TRADE	NUMBER of MEN	TRAVEL ALLOW (Hrs)	LABOR TIME (Hrs)	TOTAL (Hrs)
CARPENTRY				
Repair door surface closer	1	1/2	1/2	1
Repair concealed door closer	2	1/2	1	3
Repair door damage at shop	1	1	3	4
Repair & replace screens	1	1/2	1/2	1
Replace broken glass	1	1/2	1/2	1
Repair & replace ceiling tile	1	1/2	1/2	1
Repair small dry-wall damage	1	1/2	1	1 1/2
Repair & replace sash balance	2	1/2	1 1/2	4
Change lock on door	1	1/2	1	1 1/2
Etc.				
PAINT				
Repaint 20'x15' room, 1 coat	2	1	16	34
Repaint small bathroom, 1 coat	1	1/2	8	8 1/2
Repaint exterior window,	1	1/2	2	2 1/2
Clean & paint graffiti, sign 30"x18"	1	shop	2	2
Etc.				
PLUMBING & STEAMFITTING				
Clear stopped water closet	2	1/2	1	3
Clear stopped basin	1	1/2	1	1 1/2
Replace leaking radiator valve	2	1/2	2	5
Clear external sewer stoppage	2	1/2	4	9
Install replacement valve, faucet, or trap	2	1/2	3	7
Etc.				
ELECTRICAL				
Replace fluorescent lamp ballast	1	1/2	1	2
Reset fire or security alarm				
Replace fractional HP motor	2	1	3	8
Replace blown fuse or reset cir bkr	1	1/2	1	1 1/2
Repair exterior campus light damge	2	1/2	1	3
Control circut problems	2	1	2	5
Etc.				

Each institution should develop time standards from the maintenance tasks performed according to their records. For example, in a survey made at a large institution recently, tradesmen were asked to list in order of frequency the kinds of jobs they performed in their daily employment with the following results, Figure 3-13b.

Figure 3-13a.

JOBS PERFORMED MOST FREQUENTLY BY BASIC SHOPS

CARPENTRY SHOP

Repair door damage incl closers and checks
Repair and replace screens
Repair or replace ceiling tile
Replace broken glass
Repair sash balances and window closers
Repair or replace sheetrock damage
Repair wood floors and steps

ELECTRICAL SHOP

Correct electrical circuit problems related to clocks, security & fire alarms, intercom systems, blown fuses, tripped breakers, motor starters, etc.
Replace fluorescent lamp ballast
Replace fractional HP motors
Correct elevator problems
Repair exterior campus lights
Repair vandal damage
Maintenance & repair of electrical and telephone distribution ducts
Re-wiring overloaded or deteriorated circuits
Rerouting high and low voltage lines

LOCKSMITH SHOP

Repair or replace door locks
Repair panic hardware on exits
Make & issue new keys
Open locked doors, file cabinets, desks, cars when keys are lost
Furnish & install campus door numbers and maintain system
Repair campus mailboxes, safes, and strong boxes
Prepare and submit cost estimates

MACHINE SHOP

Repair broken window grills, bolts and hasps
Welding on automotive equipment
Repair and welding trash bins
Welding broken rails and steps of fire escapes
Repair trash chute doors
Repair shafts for pumps & motors
General welding of pipe, bars, sheets

MECHANICAL SHOP (Plumbing, Heating, Ventilating, and Air Conditioning)

Clearing stoppages in water closets, lavatories, condensate drains, sewer lines--interior and exterior
Repairing leaks and replacing defective components in pipes, valves, traps, pump seals, and refrigerant lines
Repairing or replacing ruptured coils in air handlers, convertors, and hot water generators
Installation of new valves, faucets, traps, plumbing fixtures, water coolers, shower heads, and academic equipment

PAINTING SHOP

Repainting entire areas--offices, dorm rooms, classrooms, laboratories, and shops on priority schedules
Touch-up work as result of vandalism, graffiti, water damage, etc.
Wallpapering and/or vinyl coverings

Protective Covering, Roofing and Sheetmetal, and Temperature Controls Shops on next page.

Figure 3-13b.

(Figure 3-13b continued)

PROTECTIVE COVERING SHOP (Ceramic Tile, Resilient Flooring, Pipe & Thermal Insulation)

Replace loose and worn areas in resilient flooring

Replace loose 4" vinyl cove base in all buildings

Replace entire showers in buildings where pans leak into areas below

Replacing broken ceramic tiles and regrouting

Replace pipe covering where air leaks and condenses on chilled water lines on A/C systems

Replace pipe covering on lines damaged and new lines are installed

Install blanket-type insulation on old and new duct work.

Install insulation for thermal and noise transmission reduction

ROOFING AND SHEETMETAL SHOP

Repair leaks in roof

Repair damaged downspouts and flashings

Clear clogged downspouts and gutters

Trash chute repair

Repair and install duct work

Seal shower stalls

TEMPERATURE CONTROLS SHOP

Correct thermostats out of adjustment

Correct air handling unit complaints

Correct insufficient air flow

Adjust chiller operation

Repair damaged controls

Clear stopped up strainers

Correct noisy system components

Space for additional listings

WORK ORDER LOG

To keep track of backlog, the clerk should keep a work order log. Such a record is simple to maintain and can serve to reveal unusual delays, identify unproductive crews and show dollar value of work done during any time period.

The most informal log is one the foreman keeps on his clipboard, listing work order number, date assigned, estimated completion date, and projected costs. Several simple yet efficient alternatives are:

1. General hook file holding all uncompleted work orders.
2. Separate hook files for the work orders assigned each trades group.
3. General list of all work orders assigned, noting date assigned, group responsible and estimated time and cost of completion.
4. Separate lists for each trades group.

Alternatives 3 and 4 above require more paperwork. The clerk must copy pertinent information from each work order form when first assigned and when finally returned after completion. These alternatives also provide a more accurate account of the current backlog and a record of productivity and expenses. Additional paperwork attendant on any refinements to the system must be measured against the benefits of the information gained.

WORKLOAD CONTROL

The purpose of workload control is matching the workforce with the workload. Perfect control means no work orders waiting for workmen and no workmen waiting for maintenance problems to develop, and is, of course, impossible. Building components fail and emergencies inevitably arise in random sequence. A backlog of work orders, therefore, is not a black mark against a maintenance organization but a necessary hedge against halcyon days. In fact, an organization with men sitting around waiting for work orders is obviously overstaffed.

A moderate backlog is ideal but is difficult to define in the abstract. When the rate of new work orders continually exceeds the rate of job completions, however, an immoderate backlog results.

When the backlog accumulates past the maximum time limit allowed for completing all work orders, including low priority tasks, then workload control is breaking down. The next sympton is skipping low priority jobs in the rush to remedy emergency and high priority demands. The final stage of an overload takes two forms: Either (1) work orders are written only for the most critical problems, or (2) all work orders are given the highest possible priority, unduly delaying many high priority tasks.

Recommended remedies include:

1. Hiring temporary help to alleviate the backlog.
2. Hiring a private contractor to handle selected backlogged work orders.
3. Increasing the labor force permanently.

The perfect prescription depends upon the conditions causing the backlog. Hiring temporary help or contractors is especially appropriate when a sudden increase in workload can be diagnosed as a passing phenomenon due to a seasonal overload or an unusual outbreak of problems. For example, a large number of buildings of approximately the same age may suddenly glut the backlog with numerous tasks that once remedied will not repeat annually. Increasing the work force is a solution only when it is clear that the backlog would otherwise continue to increase unchecked.

QUALITY CONTROL

Quality control insures that all maintenance work meets acceptable standards. Good quality control means more than finding and assigning blame for shoddy work; it also means instructing maintenance men on how to improve performance.

The simplest method is periodic sampling of completed work. Frequency of sampling depends upon the size of the supervisory force, but once a year for each employee is an absolute minimum. With new employees, frequent sampling should be done until the foreman is satisfied with their general competence.

The ideal procedure calls for the foreman to inspect a finished job in the presence of the man responsible. With a carpenter, he might check to see whether a door he hung, drags on the carpet or is too high; whether the wood was sealed afterwards; whether the area was cleaned; and whether any needed follow-up work such as painting was ordered. With a plumber, he might check for wrench marks on bathroom chrome. With an electrician, wiring techniques are important.

When appropriate, the foreman volunteers reprimands, instructions or commendations. The last is as important as the first to improve quality control: It bolsters morale and informs the whole labor force that high quality work is recognized and appreciated. As mentioned in Chapter 1, Personnel Administration, letters of commendation from inside or outside the department should be prominently displayed on bulletin boards near the relevant office or shop area as well as filed permanently in the employee's personnel jacket.

The BM&O segment of physical plant is most directly involved with the campus community and its educational mission and can "make or break" the image of the department.

____________ ________ UNIVERSITY/COLLEGE

____________ Address ____________

DEPARTMENT OF THE
PHYSICAL PLANT

Date ____________________

Gentlemen:

You are invited to submit a proposal for furnishing all labor, equipment, materials, etc., necessary to accomplish the work described in the attached drawings and/or specifications, for the project noted below:

PROJECT NO: ____________________
PROJECT TITLE: EXTERIOR PAINTING OF VARIOUS BUILDINGS
LOCATION: ____________________

ARCHITECT: ____________________
ENGINEER(S): ____________________

DEPOSIT: ____________
BIDS DUE: Time: ________ Date: ____________
Bids will be received and publicly opened at the following address:

Bidders MUST visit the site prior to the submission of a bid, and are requested to contact the individual(s) noted below to arrange for an appointment and to clear up any questions relative to the drawings and/or specifications. The submission of a bid shall indicate the bidder thoroughly understands the drawings and/or specifications, and the scope of the work.

____________________________ Phone: __________

Bidders must allow sufficient time for all bids, either mailed or hand carried, to reach this office by the date and time indicated for the bid opening. LATE BIDS, including those postmarked prior to the bid opening date, WILL NOT BE CONSIDERED.

Sincerely,

________________, Director
Physical Plant Department

Enclosures

________________________________ UNIVERSITY/COLLEGE

Department of the Physical Plant Date ______________

SPECIFICATIONS
FOR
EXTERIOR PAINTING OF VARIOUS BUILDINGS

SECTION I - SCOPE OF THE WORK:

1-01 The Contractor is to furnish all labor, equipment, materials, etc., necessary to accomplish the painting of the exterior trim of various buildings as listed on the attached Bid Proposal Form, and in strict accordance with these specifications.

1-02 Bidders must examine the buildings and acquaint themselves with the exact nature of the work to be done and all the conditions and obstacles likely to be encountered in their performance and completion of the work.

1-03 The submission of a bid shall indicate that the Bidder thoroughly understands the specifications and the scope of the work.

1-04 The University reserves the right to award contract on any single bid, or combination of bids, whichever is considered to be in the best interest of the University.

SECTION II - MATERIAL AND WORKMANSHIP:

2-01 Storage facilities for the painting contractor will be provided in the buildings if requested by the Contractor and will be designated by the University representative. Generally, the storage of flammable materials within buildings is not permitted for reasons of fire safety. The rooms to be furnished will be such that they may be locked by the Contractor for the protection of his equipment and materials. The room must be kept clean and orderly. Oily rags, waste, etc., must be removed from the building at the close of each working day. Smoking or the use of matches in the paint storage space will not be permitted. Storage of thinners in the paint storage space WILL NOT BE PERMITTED.

2-02 All materials must be delivered at the job site in factory sealed containers, clearly marked so as to fully identify the contents. Delivery shall be refused if not so shipped.

2-03 No thinners may be added to any manufactured painting material.

2-04 EACH COAT OF PAINT SHALL BE TINTED A DIFFERENT SHADE FROM THE FINAL APPROVED COLOR. EACH COAT OF PAINT SHALL BE INSPECTED AND APPROVED BEFORE SUCCEEDING REQUIRED COATS ARE APPLIED.

Unless otherwise specified, all surfaces to be painted shall be cleaned free of loose paint, blisters, runs, dirt, grease spots, and all scotch tape is to be removed and spots cleaned with Varsol. All protruding nails and similar items are to be "set" or removed. All holes, cracks or indentations are to be spackled or plaster pointed and sanded smooth. All nail holes and small cracks in the woodwork are to be puttied and sanded smooth.

2-05 All materials must be evenly spread and smoothly flowed on without runs or sags; woodwork to be finished with enamel shall be sanded with fine sandpaper to produce an even, smooth finish.

SECTION III - SPECIFICATIONS FOR PAINTING:

3-01 In general, all exterior surfaces presently painted shall receive two coats of paint specified. Those areas previously unpainted are not to be painted at this time. This applies particularly to unpainted window guides. These should be given an additional heavy application of linseed oil and painting contractor shall be responsible that all double-hung windows are operable, i.e., not painted shut.

3-02 Extreme care shall be taken to adequately prepare all exterior wood and metal surfaces on buildings which are to be repainted. The woodwork and metalwork should be cleaned and sanded where paint has chipped and blistered. A full time inspector from the University will be present on this contract work, and work considered to be unsatisfactory must be repainted by the Contractor at no additional expense to the Owner.

3-03 All loose caulking and putty shall be completely removed and replaced with Number M-242 Elastic Glazing Compound as manufactured by the Pecora Paint Company, Ind., Philadelphia, Pennsylvania, or an approved equal.

3-04 All exterior wood surfaces are to receive a good primer or base undercoater and an oil base finish coat. The paint used shall be highest quality white exterior house paint as manufactured by O'Brien, Benjamin Moore, Duth Boy, or approved equal.

3-05 Paint shall be non-chalking of the variety guaranteed by the manufacturer not to run down and discolor red brick exterior walls.

________________________ UNIVERSITY/COLLEGE

Department of the Physical Plant   Date ____________________

BID PROPOSAL

EXTERIOR PAINTING OF VARIOUS BUILDINGS

at
________________ University
________________ Address

We propose to furnish all labor, equipment, materials, etc., necessary for EXTERIOR PAINTING of various buildings on the __________ Campus of the University of ______________ all in accordance with the specifications for the following LUMP SUMS:

BUILDING NUMBER	and/or BUILDING NAME	COST	CALENDAR DAYS TO COMPLETE
		$	
		$	
		$	
		$	
		$	
		$	
		$	
		$	

GRAND TOTAL (All Buildings)... $ ______________ ______________

Enclosed with the Proposal is a Bid Bond in the amount of five percent of the total amount of the above Bid Proposal. It is understood that the University reserves the right to award this contract in its entirety, or any portion thereof.

____
Firm Name

Page 1 of 2

University of ________________
Department of the Physical Plant
Page 2 - Bid Proposal
EXTERIOR PAINTING OF VARIOUS BUILDINGS

The manufacturers and identifying trade or brand names or numbers of the paints which we intend to use for the work specified are:

WOODWORK......................Base Coat ____________________
Finish Coat ____________________
METAL SURFACES........................ ____________________

JOB INSPECTION OF MATERIALS: This requirement is included in order to insure that the Paint Bid shown in this specification is actually used throughout the job. University inspectors reserve the right to withdraw one gallon of paint at any time which may be laboratory tested to insure compliance with this requirement of the specification. Contractors found guilty of substitutes of unapproved materials will be required to remove all unapproved material and apply that originally approved and may disqualify themselves in bidding further work at the University of ________________.

Should the University desire to extend the contract to other work on a "Time and Material" basis, the following proposal shall apply with overhead and profit percentages applied separately to the material and labor costs:

FOR MATERIALS: OVERHEAD AND PROFIT TOTAL........... ________ %

FOR LABOR:

	PAINTER FOREMAN	PAINTER
Pay Scale.............................	$_______/hr	$_______/hr
Welfare Benefits......................	$_______/hr	$_______/hr
Social Security.......................	$_______/hr	$_______/hr
Insurance.............................	$_______/hr	$_______/hr
Overhead and Profit on Labor..........	$_______/hr	$_______/hr
Other Items (Specify)		
______________________________....	$_______/hr	$_______/hr
______________________________....	$_______/hr	$_______/hr
______________________________....	$_______/hr	$_______/hr
TOTAL LABOR CHARGE PER HOUR	$_________	$_________

CONTRACTOR'S LICENSE NO: ________________

Signed: ____________________

Firm: ____________________

Address: ____________________
____

Phone: ____________________

BID PROPOSAL MUST BE SUBMITTED IN TRIPLICATE

4

CUSTODIAL SERVICES

INTRODUCTION 129-132
STANDARDS 132-134
Figure 4-1 : Achievement Levels of Cleaning for Major Areas
STAFFING 134-139
Figure 4-2 : Sample Inventory of Light Duty Custodial Tasks
Figure 4-3 : Sample Inventory of Heavy Duty Custodial Tasks
WORK ASSIGNMENTS 140-141
SUPERVISION 141-147
Figure 4-4 : Sample Inspection Sheet
TRAINING 147-157
Figure 4-5 : Suggested Outline for Custodial Training Program
Figure 4-6 : Suggested Job Sheet for Cleaning Urinals
Figure 4-7 : Suggested Job Sheet for Cleaning Light Fixtures
Figure 4-8 : Suggested Job Sheet for Cleaning Classrooms
Figure 4-9 : Training Aid Example, How to Brush Sweep a Stairway
EQUIPMENT 158-159
LABOR-SAVING DESIGNS AND PRACTICES 159-164
Figure 4-10: Criteria for a Custodian Closet
CONTRACT CLEANING 164-166
CONSULTANTS 166-167

APPENDICES:

4-A INDEX TO VISUAL AIDS FOR TRAINING 168-190
4-B SAMPLE SPECIFICATIONS FOR CONTRACT JANITORIAL SERVICES 191-199

4

CUSTODIAL SERVICES

THE IMPORTANT FACTS about custodial services are these: Cleaning operations usually consume 20% to 40% of a physical plant budget depending upon the number of functions performed by physical plant. Of this amount 90% to 95% goes to meet the cost of labor. And the custodial labor force is traditionally plagued by a high turnover. Given such facts, improved management techniques should reap significant savings at most schools, a conclusion supported by management experts who find at least 25% waste manpower in most institutional cleaning.

The important goal for a custodial service at an educational institution, however, should not be economy. The primary aim is to support the school in its basic mission--providing quality education at efficient cost. Unfortunately, few academicians and administrators appreciate the contribution of the custodial operation, and few physical plant administrators bother to explain and defend it. Yet, one of the basic assumptions of current psychological and educational theory hold that environment is a major influence on behavior. One basic assumption of this chapter, therefore, is that clean rooms, offices, corridors and restrooms are more than a necessary evil oppressing the physical plant budget: They constitute a strong and positive contribution to the educational process. Effective cleaning practices not only preserve equipment and extend the life of the structure, they also protect health, promote safety, and improve morale among students, faculty and staff. A clean school encourages neatness, self-discipline and respect for property and the rights of others. Another basic assumption of this work is that such old fashioned virtues are still pertinent to education.

STANDARDS

The logical way for an administrator to set a cleaning operation in motion would be to establish standards or levels of cleanliness and then deduce what funds, methods, personnel and equipment would be needed to achieve them. In the real world, however, men seldom create organizations *ex nihilo*; they inherit ongoing operations with standards determined by past funding levels. Nor do they find logically developed, widely accepted standards to apply. Although all authorities assert that every school must develop cleaning standards, most lapse into silence before explaining what these standards should be or how they should be discovered.

Such reticence may spring from the nature of the problem: it is difficult to discuss degrees of cleanliness in logical, empirical terms. Each individual's perception to cleanliness and dirt depends on a variety of factors like taste, aesthetics, home life, economic background, personal philosophy and religious training. ("Cleanliness is next to Godliness.") When general levels of cleanliness have to be established for large groups, the problem is compounded. Most writers, therefore, close a discussion of standards by recommending that each school establish them according to "institutional preference."

In practice, there are two kinds of cleaning standards: general and specific. General standards usually apply to the whole school or to individual buildings, and it is usually the members of the governing board who decide which level of cleanliness--"fair," "good," or "outstanding"--will be met under current budgetary conditions. Specific standards apply to the frequencies and methods used for particular cleaning tasks. To work a change in general standards, the custodial division alters the specific standards. For example, as part of a program to upgrade a campus from "fair" to "good," the custodial administrator might require all hallways to be damp mopped thrice weekly instad of once weekly and all rugs and carpets to be vacuumed daily instead of weekly.

Defining these general and specific standards will inevitably require crude categories such as "fair," "good," and "outstanding," or "minimal," "median," and "ideal." And defining such categories can easily lead to endless argument, unless someone has and uses the authority to impose arbitrary definitions. Imperfect though they be, such definitions are essential, since they determine the assignment of men and money. It is especially important that the specific standards be clearly defined, since they are the means for achieving the general standards. This is the job of the custodial administrator.

In a well organized custodial division, the administrator will eventually be able to show the governing board exactly how much time (and therefore how much money) will be needed to achieve each level for every major kind of area. Figure 4-1 shows such a list as developed for North Carolina State University.

ACHIEVEMENT LEVELS OF CLEANING FOR MAJOR AREAS

North Carolina State Formula Time Standards

	IDEAL	MEDIAN	MINIMUM
2 - Station Office	12 Min.	10 Min.	8 Min.
30 - Station Classroom	25	20	15
20 - Station Laboratory	30	25	20
15 - Station Conference Room	20	15	10
10 - Station Lounge	17	15	10
Small Library	21	15	10
6 - Fixture Bathroom	23	20	20
Stockroom (150 sq. ft.)	7	5	3
2 - Man Bedroom	12	12	10

Figure 4-1. Achievement Levels of Cleaning for Major Areas

When, as is usually the case, the custodial administrator inherits ongoing cleaning service with implicit standards based on past funding, he would be wise to find out exactly what kind of job the service is doing before defining explicit standards and altering the operation. To analyze the situation, administrators might initiate a crash evaluation by finding out how both the cleaners and the occupants appraise the existing program.

The first step is to design a questionnaire for employees to answer. On this form they would describe the tasks they think they are responsible for, note the frequency of execution, and evaluate the effectiveness of their work. The second step would be to distribute, via the cleaning personnel, a similar questionnaire on which the occupants would describe the cleaners' work and rate the results as good, fair, or poor.

From this information, custodial administrators can derive a comprehensive picture of the actual work being done and a fairly reliable estimate of the actual standards being maintained. This data should clarify whether the service needs expansion or streamlining. Any change in standards, of course, should originate not with the custodial division or even the physical plant department. Such policy matters are the proper responsibility of higher level administrative and governing groups. The physical plant department, however, has the responsibility of providing the best information available to help these groups reach intelligent decisions. And these surveys should accomplish that result.

STAFFING

For the custodial administrator, a policy statement from the governing bodies about general cleaning standards will considerably simplify the practical problems of determining staff needs. A standards policy will give him a goal for cleaning frequencies and methods which he can then convert into numbers of men and types of equipment. Such a statement will simplify, but not solve, his problems.

The next step after establishing standards is to compile a custodial inventory, a complete list of all jobs for which the division is responsible during one complete year. The evaluation questionnaire mentioned earlier could be of considerable help at this point. With this inventory the administrator can see what the annual man hour load for his department should be. A few deductions for sick leave, vacations, holidays, etc., should give the total work force needed. This process sounds painlessly simple, but the attendant complications are sufficient to inspire migraine among most administrators.

The complications make it unrealistic to discuss the inventory separate from the staffing methods. Three basic approaches are popular, but no widespread agreement exists about which type is the most effective. There is considerable agreement, however, that the most sophisticated methods will probably increase custodial efficiency and will definitely require more time and energy to put into practice. In order of complexity they are:

1. Square Footage. This approach simply utilizes a crude rule-of-thumb guide, such as one man-year per 15,000 GSF, to pick one arbitrary figure. The administrator simply divides the school's total floor area by this figure to get the number of men needed to handle the annual workload. Because this method is the simplest, it is probably the most popular. Because it fails to distinguish among the different kinds of space to be cleaned (i.e., gym floors versus office space), it is definitely the most inaccurate, unless carefully modified on the basis of experience and results.

2. Typical Area Measurement. As developed by J. McCree Smith at North Carolina State University, this system is basically a modification of the traditional time and motion study and requires administrators to follow six basic steps:

   (1) Catalog each building for the different spaces to be cleaned: office, classroom, laboratories.
   (2) Time the work of several custodians in each kind of area, and observe the different methods employed.
   (3) Average all times for like areas. This number will be important for calculating total work force and for estimating future workload changes resulting from new buildings.
   (4) Divide each building into floors. Calculate workload for each floor by multiplying the number of each area by its average cleaning time. For example, 6 offices at 10 minutes per office means 60 minutes cleaning time is required.
   (5) Add all the times together. Divide by the number of minutes each custodian works per day to get the number of men required to perform the duties at the specified cleaning level.
   (6) To establish the budget request, classify the positions and multiply the number of positions by the proposed wage.

136

3. Time and Motion. This method requires a total inventory of each task the custodial division must perform:

   (1) Supervisors must go into every room of every building on campus and count the number of desks, chairs, file cabinets, trash baskets. light fixtures, air registers, window shades and blinds, and then record the different types of cleaning surfaces on these fixtures, floors, walls and ceilings.
   (2) With such an inventory, the supervisor looks up what the average cleaning time should be for each separate task. His source might be the average cleaning times as estimated and published by the ENVIRONMENTAL MANAGEMENT ASSOCIATION, 1710 Drew Street, Clearwater, Florida 33515, phone (813) 446-1674, or as modified to his experience. See Figure 4-2, Sample Inventory of Light Duty Custodial Tasks and Figure 4-3, Sample Inventory of Heavy Duty Custodial Tasks.
   (3) Using the cleaning standards in force at his school, the administrator then multiplies the frequencies for each job by the average cleaning time.
   (4) By adding the results, he will find the total number of man hours required annually. From this sum, he can determine the number of men needed for the custodial staff.

Since these calculations utilize national averages, the important variable to watch for is local differences in worker productivity, which can be significant. Any administrator with the time could develop a more accurate variant of this method by measuring and averaging actual work times of employees and comparing them with the time standards of the National Sanitation Foundation.

This kind of inventory is time-consuming to compile, but it will provide several benefits. It will not only help the administrator establish staffing requirements with greater accuracy than the other methods, but it will also enable him to develop realistic and equitable job assignments, comprehensive job descriptions, daily quality control check lists and effective job correction procedures.

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SAMPLE INVENTORY OF LIGHT DUTY CUSTODIAL TASKS

Building ________________ Room ____________ Square Feet ____

OPERATION	WEEKLY FRE-QUENCY	QUAN-TITY	UNIT MEASURE	UNIT TIME	WEEKLY TIME
Ash Tray, clean			Each	.25	
Ash Urn, empty			Each	1.00	
Bookcase, dust			Each	.36	
Bulletin Boards, change			Each	1.80	
Chairs, Medium, dust			Each	.58	
Chairs, Small, dust			Each	.37	
Chalk Boards, clean			100 Lin Ft	17.70	
Desk, Large, dust			Each	.80	
Desk, Small, dust			Each	.63	
Doors, clean			Each	.67	
Drinking Fountain, wash			Each	2.00	
Filing Cabinets, dust			Each	.37	
Floor, dry clean (Heavily Obstructed)			M Sq Ft	16.00	
Floor, dry clean (Slightly Obstructed)			M sq Ft	10.00	
Floor, dry clean (Unobstructed)			M Sq Ft	5.00	
Furniture, vacuum			Each	2.16	
Hospital Unit, clean			Each	15.00	
Hospital Unit, Check Out, clean			Each	30.00	
Lamps, dust			Each	.25	
Lecturn, dust			Each	.25	
Lockers, dust			100 Lin Ft	5.00	
Mirror, wash and polish			Sq Ft	.10	
Pencil Sharpener, empty			Each	.25	
Piano, dust & wash keys			Each	2.50	
Radiator, dust			Each	.60	
Rugs, vacuum			M Sq Ft	22.20	
Shelves, dust			100 Lin Ft	2.00	
Sink, Soap Dispenser, clean and refill			Each	2.00	
Stairs, dust			Flight	4.00	
Telephone, dust			Each	.15	
Toilet, clean, private			Each	1.00	
Towel Disp, clean/refill			Each	.25	
Venetian Blind, dust			Each	3.50	
Waste Basket, empty			Each	.25	
Window Sill, dust			Each	.20	
Windows, wash, Inside			Sq Ft	.168	

Figure 4-2. Sample Inventory of Light Duty Custodial Tasks

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SAMPLE INVENTORY OF HEAVY DUTY CUSTODIAL TASKS

Building ____________________ Room ______________ Square Feet ___

OPERATION	WEEKLY FRE-QUENCY	QUAN-TITY	UNIT MEASURE	UNIT TIME	WEEKLY TIME
Airvents, clean			Each	2.00	
Drapes, remove & replace			Pair	20.00	
Elevator, clean			Each	3.25	
Floor, mop, damp (Heavily Obstructed)			M Sq Ft	32.00	
Floor, mop, damp (Slightly Obstructed)			M Sq Ft	23.00	
Floor, mop, damp (Unobstructed)			M Sq Ft	16.00	
Floor, scrub (Heavily Obstructed)			M Sq Ft	55.00	
Floor, scrub (Slightly Obstructed)			M Sq Ft	45.00	
Floor, scrub (Unobstructed)			M Sq Ft	35.00	
Floors, auto scrub			M Sq Ft	12.00	
Floors, refinish (Heavily Obstructed)			M Sq Ft	180.00	
Floors, spray buff			M Sq Ft	100.00	
Light Fixture, relamp & clean			Ea/Sec/	10.00	
Mats, wash & replace			Each	10.00	
Rugs, shampoo			M Sq Ft	210.00	
Stairs, mop			Flight	10.00	
Toilet & Partition, clean			Each	3.00	
Urinal, clean			Each	2.00	
Venetian Blind, wash			Each	20.00	
Walls, wash			Sq Ft	.30	
Windows, wash, outside			Sq Ft	.168	

Figure 4-3. Sample Inventory of Heavy Duty Custodial Tasks

After using one of these methods to determine annual workload, the custodial administrator will still have additional arithmetic to finish before he has his final staff needs. From the number 2,080--40 hours per week multiplied by 52--he must subtract for vacations, holidays and average sick leaves, an operation which usually reduces the number of productive work hours to approximately 1,800. Using this latter figure he can divide his annual man-hour workload to get the number of cleaners needed. He can then estimate how many supervisors are necessary, usually at a ratio of 1 supervisor per every 8 to 10 cleaners. Supervisors added to cleaners should give the total work force needed.

Two additional factors remain to complicate the calculations. First comes the question of lost time--how many minutes and hours does each employee waste each day while changing clothes, moving from one job site to another, taking coffee breaks and "goldbricking." Although the cleaning time averages published by the National Sanitation Foundation include some leeway for this problem, the situation can vary widely in different parts of the country. Each administrator would be well advised, therefore, to research the labor force and work practices in his particular locality before working a productive time factor into his staffing equations. One way to do this would be to ask the local telephone and utility companies about their experience.

A closely related issue is the problem of unscheduled assignments. The administrator can assign each employee enough work to occupy 85% of each work day (or whatever percentage is appropriate to the particular school), and leave the remainder of the day free for unscheduled work. The simplicity of this method is obvious, and so is the danger. On most work days, the employee will not encounter unscheduled assignments. If Parkinson is correct and work does expand to fill the available time, then the custodian will eventually acclimate himself to less work. Another drawback is that extra supervision is usually necessary when cleaners are taken away from their routine assignments. With the second method the administrator assigns all of the time of 85% of his workers to routine tasks and holds 15% in reserve for unscheduled and less frequently recurring jobs. Since most custodians perform better on routine chores, this method keeps the majority of the staff working efficiently.

WORK ASSIGNMENTS

For assigning regularly scheduled custodial work, two basic methods are most widely used by educational institutions. The first entails assigning one individual the responsibility for everything in a designated area such as one floor of a large building; the second requires assigning a group of men to handle all the jobs in a larger area such as a whole building. Both approaches have adherents within the cleaning industry. Although debate has not resolved which is the best, it has clarified the following advantages:

AREA ASSIGNMENTS

1. Pride of achievement is generally stronger when the employee knows he has sole responsibility for an area.
2. Less monotony results when the employee has a variety of different tasks to handle each working day.
3. The improved morale these advantages produce helps reduce turnover, always a problem with custodial workers.
4. Responsibility for poor work, breakage and even petty thievery is established when each area is assigned to one employee.
5. It is relatively easy for one man to arrange his work sequence around the use needs of the occupants.

SQUAD CLEANING

1. The primary advantage is greater specialization. Instead of one man performing all the tasks in a certain area, squads specialize in a limited number of tasks and, theoretically at least, complete them more efficiently. Because of specialization, proponents claim that more work is accomplished with fewer men.
2. Morale is improved because employees have company while working.

3. Less equipment is needed than with area assignments.

4. Employee workloads are more equitably distributed.

5. Unexpected absences cause less disruption, since several workers cover every area.

Many schools have found it best to combine the two methods. For many simple, daily tasks, individual area assignments would seem to be most efficient; and for many of the heavier, more complicated, and less frequent jobs, squad assignments are more appropriate. Damp mopping, dusting, trash collecting, and similar simple jobs require only one man, and two or more would be wasteful.

On the other hand, refinishing floors, cleaning high areas with scaffolds, and cleaning and reinstalling venetian blinds inevitably require more than one person. Such infrequent jobs could be assigned to specialized squads which would perform them in all buildings according to a regular schedule. This approach eliminates the problem of teaching every individual specialized skills that he would only use sporadically.

The special conditions at each campus dictate the optimum solution; the key recommendation is to analyze the total cleaning problem with the respective advantages of both methods in mind.

SUPERVISION

For a scheduling method to work well effective supervision is essential. The key elements of a good supervisory system are frequent inspections.

There are two major kinds of inspections. The first is done on a fairly frequent basis by custodial supervisors who assign and control the cleaners. On these tours, the supervisors look for omissions and substandard work, and recommend corrective action: reprimands, retraining or re-assignments. They also commend excellent work. The purpose of these inspections is to let the cleaners know that their work is watched and rewarded. Failure to do this results in shoddy or neglected work.

To insure comprehensive and consistent inspections, the custodial manager should provide supervisors with a checklist and rating system for each kind of cleaning job. The kind of inspection guide shown in Figure 4-4 enables supervisors to rate work of subordinates and identify who is working well and who is not. This guide can also structure inspection reports from which custodians can learn how to improve their work.

The second kind of inspection is handled by management. The purpose of these inspections is to oversee workers and supervisors and to produce constructive memoranda to assist them. To be of help, such reports should list specific deficiencies noted and mention possible remedies.

The supervisor is the heart of the custodial system. He schedules the workers, instructs them, inspects their work and directs corrections of their errors. Given the problems peculiar to the custodial field, the most important attribute of an effective supervisor is ability to motivate workers. Experience is also helpful, but the changing nature of the work often renders obsolete previously effective methods and materials. Motivating employees is so important because most cleaning costs go into labor, and most of the labor force are traditionally less formally educated and poorly paid. To inspire them to work hard and efficiently, the supervisor must know the jobs well himself and be able to communicate this knowledge.

Once able supervisors have been found, it is important that they continue researching new developments in the cleaning industry. They should be encouraged to join organizations such as the Institute of Environmental Management and the National Executive Housekeepers' Association, to visit other facilities where new methods are under trial, to read current literature and to attend pertinent APPA workshops. These activities will take time from work duties and money from the budget, but can pay off in reduced costs and greater efficiency.

How many supervisors does a custodial force need? Although administrators must answer this question in relation to the work conditions and labor force at their institutions, they may find the following guidelines helpful. For very small schools where the custodial force numbers less than 10 full-time employees, 1 supervisor could be sufficient and could probably handle other tasks also, such as supervising grounds maintenance crews. For a force

INSPECTION SHEET

EVALUATION OF ______________ (Custodial Personnel)

EVALUATION BY ______________ (Custodial Supervisor)

////	I. FLOOR MOPPING
	Very dirty; shows no cleaning effort; heavy caked on deposits.
	Mopped but not completely clean; lightly caked on dirt in traffic areas; areas around washbowls, stools and urinals still dirty.
	Acceptable; has been mopped so that traffic areas are faint; areas around washbowls, stools and urinals almost dirt free.
	Clean; shows special effort; no traces of dirt in areas around washbowls, stools and urinals.
////	II. FLOOR WAXING
	Little or no wax on any part of floor.
	Wax worn in traffic areas.
	Traffic areas show wear but still have wax.
	Recently waxed and buffed; shows extra effort.
////	III. DRINKING FOUNTAINS
	No evidence of effort; chewing gum and/or litter in base of bowl; top and sides dirty.
	Bowl and top surfaces clean; bright metal sides not clean.
	Acceptable; bowl, sides and top surfaces clean; metal clean but not polished.
	Very clean; lustrous surfaces; metal polished; indicates extra effort.

////	IV. SWEEPING
	Floor not swept; no evidence of effort; area (sandy) (littered) (has lint).
	Floor swept only in readily accessible areas; corners and areas under and around furniture and radiators (sandy) (dusty) (have lint).
	Floor acceptable; accessible areas, corners and areas around and under furniture and radiators free from litter, sand or heavy dust.
	Floor not only acceptable but appears to be almost completely dust free.
////	V. STAIRWAYS
	No evidence of effort; have not been swept; dirt and litter heavy; treads on risers have heavily caked deposits.
	Free from litter but not thoroughly swept; missed dirt deposits in corners; treads and risers still show caked dirt.
	Acceptable; free from litter and well swept; corners free from dirt; treads and risers only slightly filmed.
	Very clean; corners completely dirt free; treads and risers free from dirt deposits.

Figure 4-4. Inspection Sheet (sheet 1 of 4)

INSPECTION SHEET (continued)

////	VI. GLASS
	Very dirty; visibility highly impaired; probably not cleaned for some time.
	Dusty; streaks apparent; only moderate visibility; view on opposite side not clear.
	Slightly dusty; visibility good; surface comparatively streak free; shows evidence of cleaning at prescribed intervals.
	Almost dust free, excellent visibility; indicate more frequent cleaning than called for by schedule; at time of inspection appears to be very recently cleaned.
////	VII. VENETIAN BLINDS
	No evidence of any effort; blinds very dirty; heavy dust deposits.
	Show results of intermittent cleaning; dust deposits not heavy enough to obscure actual slat surfaces.
	Blinds acceptable; dust deposits light, indicating accumulation over relatively short period of time; actual slat surfaces readily evident.
	Very clean; relatively dust free and appear to have been washed as well as suction cleaned.
////	VIII. RADIATORS (Standard Type)
	No evidence of effort; very dirty on tops and between section and tubes.
	Cleaned but only on tops; sections and tubes show heavy dust deposits.

////	RADIATORS (continued)
	Acceptable; tops free from dirt; sections and tubes show light dust deposits; indicate cleaning at prescribed intervals.
	Very clean on tops, sections and tubes; shows extra effort.
////	IX. LIGHT FIXTURES
	Very dirty; heavy dust deposits on top surfaces; lamps very dirty.
	Show results of very occasional cleaning; dust deposits still heavy enough to impair full lighting efficiency of lamps.
	Acceptable; dust deposits moderate; lighting efficiency not seriously affected as yet; indicate cleaning at prescribed intervals.
	Very clean; dust deposits extremely slight; indicate recent cleaning
////	X. DUSTING
	Nothing dusted; heavy deposits hide surfaces; no evidence of effort.
	Moderately dusty; dust deposits do not obscure actual surface; evidence that surface has received intermittent dusting.
	Acceptable; well dusted; dust deposits very light indicating accumulation has been over relatively short time; surfaces evident; looks clean.
	Acceptable with positive evidence of extra effort; use of polish or wax indicated; surfaces very clean.

Figure 4-4 Inspection Sheet (sheet 2 of 4)

INSPECTION SHEET (continued)

////	XI. BLACKBOARDS
	No evidence of any effort; blackboards are (not erased and dirty) (erased but unwashed).
	Blackboards cleaned but not acceptable; streaked; chalk deposits in pores; heavily caked.
	Acceptable; clean and streak free; only slight deposits of chalk in pores.
////	XII. CHALK TRAYS
	No evidence of any effort; heavy layers of chalk dust in trays.
	Show result of intermittent cleaning; chalk dust still readily evident in tray but not heavy.
	Acceptable; free from chalk dust but actual surfaces covered by whitish film.
	Clean; no chalk dust evident and actual surfaces are visible; indicate they have been washed frequently.
////	XIII. TOILETS - STOOLS
	Stools very dirty; heavy scum line in bowl; sidewalls streaked and/or rust stained; inside rim edge dirty and/or rust; surfaces are dirty; no evidence of effort.
	Stools show some cleaning efforts but only on readily accessible surfaces; seats and sidewalls clean; scum line slightly evident; inside rim edge and bright metal still not clean; some flush vents still clogged and exterior sides are dirty.
////	TOILETS - STOOLS (continued)
	Stools acceptable; seats and sidewalls clean; no evidence of scum line in bowl inside rim edge; bright netal and exterior sides are clean; flush vents clean and free.
	Stools very clean; meet conditions of above standard but show extra effort; surface enamel has high lustre indicating thorough rinsing.
////	XIV. TOILET PARTITIONS
	Partitions generally dirty; soiled area around paper dispenser; writing and drawing spread over partition; heavy dust on ledges.
	Partitions spot cleaned of writing and drawing; dusty and soiled.
	Partitions generally clean; ledges dusted; all writing and drawing removed
	Partitions uniformly clean; free of all soil, spots and marks
////	XV. TOILETS - URINALS
	Urinals very dirty; walls rust stained and streaked; heavy rust and dirt deposits on inside of lip edges; drains have odor and some flush vents clogged; no evidence of effort.
	Urinals show some cleaning efforts on readily accessible surfaces; inside lip edges still show rust stains and/or dirt; flush vents open but dirty around openings; faint streaks on urinal walls; bright metal still not clean.

Figure 4-4. Inspection Sheet (sheet 3 of 4)

INSPECTION SHEET (continued)

////	TOILETS - URINALS (continued)
	Urinals acceptable; walls streak free; flush vents clean and free; slight traces of rust and/or dirt on inside lip edges; bright metal clean and drains are odorless.
	Urinals very clean; meet conditions of standards above but show extra effort; surface enamel is lustrous indicating thorough rinsing.
////	XVI. WASHBOWLS
	Washbowls very dirty; bowl ledges show caked soap deposits; bright metal is dirty; scum line present in bowl; no evidence of effort.
	Washbowls show cleaning efforts; ledges and top surface clean but scum line still slightly evident in bowl; bright metal clean on top but is dirty under the bowl; underside of bowls still dirty.
	Washbowls acceptable; no evidence of scum line; ledges and top surfaces free from dirt; bright metal clean underneath and on top; undersides of bowls well cleaned.
	Washbowls very clean; meet conditions of standard above but show evidence of extra effort; surface enamel has high lustre indicating thorough rinsing.

DATE OF INSPECTION: ______________________

Other Comments:

Figure 4-4. Inspection Sheet (sheet 4 of 4)

of 10 or more, a full-time supervisor is justified, although he might also serve as head of the whole custodial department. For groups this size and larger, additional supervisory grades would be appropriate, perhaps 1 working "head janitor" for every 8 cleaners. A custodial department that relies heavily on squad cleaning will need to provide more supervision than is necessary with individual area assignments, and its percentage of supervisory personnel will be somewhat higher than those suggested here. With small and large staffs, it is essential that the chain of command be kept clear and simple: every man should know who assigns and appraises his work.

TRAINING

Since many custodians have received little formal education, administrators must place high and constant priority on effective training. Complicating the problem are the usual high turnover and frequent improvements in cleaning technology requiring revisions in methods and materials. This means the custodial department must devote time and money to orientation; classroom sessions; on-the-job training and retraining; preparation and revision of cleaning manuals; and careful record keeping.

Good training starts the minute the employee goes on the payroll. It includes an orientation period during which a supervisor personally assists the new worker in the following ways:

1. Define his duties clearly so that he knows exactly what is expected of him.
2. Show him where his tools are located. Show him the work area, locker room, cafeteria, and time clock.
3. Introduce him to his immediate supervisor and fellow workers.
4. Explain basic rules and regulations governing employment such as those dealing with safety, accidents, smoking, drinking, and absenteeism.
5. Explain the length and nature of the probationary period, if one is in effect.
6. Encourage him to seek help if he needs it, and tell him where to find it.

7. Tell him when and where he will receive his pay check.

8. Answer any questions he has.

It is not the purpose of this kind of orientation to teach all required job skills; that will come later. The purpose at this point is to create an impression of friendly, well organized and efficient operation. Such first impressions can be suprisingly effective in encouraging receptive, cooperative attitudes among new employees. In many cases, trial and error is unavoidable because the new custodian must be put to work immediately.

Detailed instruction should come in two forms, on-the-job training and classroom sessions. Because most cleaning jobs require a certain amount of manual dexterity and muscular coordination, actual supervised trials provide the most productive learning experiences for the novice. On-the-job training naturally consists of such supervised trials and errors, and classroom instruction should also include these experiences. In most cases trial and error starts early, simply because the new custodian starts working immediately, and it is imperative that he be given some instruction at the start to prevent the development of bad work habits and methods. It is important that more detailed instruction be given as soon as possible to help him develop the most efficient approaches to his various tasks.

For training sessions, choose employees who through practice or talent have become the best cleaners and ask them to demonstrate those operations they have mastered. These sessions can be scheduled in the appropriate work areas before small groups of new workers. To get the message across, the supervisor should have novices attempt the operation on the spot under the scrutiny of the expert. As mentioned before, this is the optimum teaching method for this kind of information.

Because of the variety of tasks and materials the custodian must master, formal training sessions are also necessary in a well-developed training program. These meetings, when well managed, serve to instruct custodians in basic topics such as the most efficient way to clean a classroom and in esoteric matters such as how various cleaning chemicals react with different surfaces. It is through these sessions that administrators and supervisors disseminate what they have learned about recent improvements in cleaning methods and technology. Such sessions can serve, therefore, both for instructing new employees and for retraining experienced workers.

For new employees, custodial administrators will find it wise to provide some instruction in as many cleaning techniques and procedures as possible. See Figure 4-5, Suggested Outline for Custodial Training Program. Although not exhaustive, the list is extensive enough to serve as the basis for setting up a new training program. Though few employees will thoroughly master all methods and tasks mentioned, each should be familiar with all and expert in several. This familiarity improves cooperation among custodians, since each understands the problems his colleagues have to handle; and this limited versatility creates flexibility that is essential if a custodial operation is to function successfully in the midst of unexpected absences.

Since there is one most efficient way to handle each job and many less efficient methods, good training that effectively teaches custodians the right way will cut labor costs. To realize this potential saving, instructors must thoroughly cover each step of the major jobs mentioned in the Training Program Outline. Figures 4-6, 4-7 and 4-8 show suggested lesson plans for sessions on cleaning classrooms, urinals and light fixtures.

Effective classroom sessions require careful planning. If the program appears disorganized and undeveloped, or is abandoned after one or two meetings, more damage than good can result. Employees will learn one thing only: that the management puts little value on their work. To avoid this, organize efficiently. Put one capable individual in charge and give him the authority to delegate responsibility for the major phases of training. He should draw up the list of topics, arrange for instructors and special materials, establish class dates and times according to a regular schedule that will be easy to remember (every Wednesday at 9:00 a.m., for instance), and publicize the topic of each particular session in advance (preferably a month ahead of the date).

Not only should the training supervisor select teachers and materials with care, but he should also consider how to logically match his audience and topics for each particular class. Employees thoroughly trained in a specific task should be excused, unless they are to participate in demonstrations or learn new methods. Similarly, employees who have no need for the information covered should also be eliminated. In all cases, exclude anyone who has no interest in the subject. Boredom is inevitably contagious, even in a well-run class.

SUGGESTED OUTLINE FOR CUSTODIAL TRAINING PROGRAM

I. IMPORTANCE OF CUSTODIAL SERVICES WITHIN PHYSICAL PLANT DEPARTMENT
II. QUALIFICATIONS OF A GOOD CUSTODIAN
III. DEFINITIONS OF BASIC OPERATIONAL TASKS
IV. METHODS OF PERFORMING BASIC OPERATIONAL TASKS AND FREQUENCY OF PERFORMANCE
  A. Dry Dusting by Hand
  B. Wet Cleaning by Hand
  C. Dry Mopping
  D. Wet Mopping
  E. Sweeping
  F. Scrubbing
  G. Waxing
  H. Polishing
  I. Stripping
V. CLEANING SPECIAL EQUIPMENT, FIXTURES AND SURFACES
  A. Equipment and Fixtures
    1. Classroom Furniture
    2. Chalkboards
    3. Lecture Hall Seats
    4. Administrative Office Furniture
    5. Clerical Office Furniture:
      desks, tables, file cabinets
    6. Restrooms and Lounges:
      toilets, *urinals, wash bowls, waste receptacles
    7. Heating and Ventilating
    *8. Light Fixtures
    9. Waste Baskets
    10. Ash Trays
    11. Window Sills and Frames
    12. Doors and Frames
  B. Surfaces
    1. Floors:
      wood, ceramic tile, terrazzo, composition, resilient, carpeted
    2. Walls:
      plastered, wood panelling, metal partitions, ceramic tile, cinder block
    3. Ceilings:
      plastered, acoustical tile, removable panel
    4. Metal and Plastic Surfaces:
      chrome, copper, brass, aluminum, stainless steel, formica, vinyl
    5. Glass and Mirrors
VI. CLEANING PROCEDURES FOR BUILDING AREAS
  A. General Use Areas
    1. Lobbies-Entrances-Foyers
    2. Stairways and Stairwells
    3. Hallways-Corridors
    4. Elevators
  B. Specific Areas
    *1. Classrooms
    2. Laboratories
    3. Auditoriums and Lecture Halls
    4. Gymnasiums
    5. Restrooms and Lounges
    6. Administrative Offices
    7. Clerical Offices
VII. PEST CONTROL PRACTICES
VIII. CARE AND MAINTENANCE OF CUSTODIAL MATERIALS, TOOLS AND EQUIPMENT
IX. STANDARDS OF CLEANING AS MEASURED BY RESULTS AND OBSERVATION

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* Detailed Job Sheets for asterisked topics are shown as Figures 4-6, 4-7 and 4-8

Figure 4-5

DETAILED JOB SHEET
CLEANING SPECIAL EQUIPMENT, FIXTURES AND SURFACES

RESTROOMS AND LOUNGES
DAILY CLEANING OF URINALS

TOOLS AND MATERIALS:

Rubber gloves
Small bucket
Sponge

Hand mirror
Dry cloth
Cleaning agent
Sanitizing solution

SUGGESTED METHOD TO USE IN CLEANING URINALS:

1. Wearing rubber gloves, wipe outer surface of urinal with sponge partially wrung out to prevent dripping.

2. Sprinkle cleaning agent on sponge and clean inside of urinal making sure all surfaces are clean.

3. Flush urinal.

4. Check with hand mirror to see if all inside surfaces are clean. If not, do the necessary cleaning with the sponge. Flush again.

5. Wring out sponge in sanitizing solution.

6. Continue above steps to complete battery of urinals.

7. Damp wipe exposed piping and valves with sponge. Do not use abrasives.

8. Polish with dry cloth the exposed piping and valves to keep chrome and/or brass fixtures bright and clean.

9. Return and store tools and materials properly for next use.

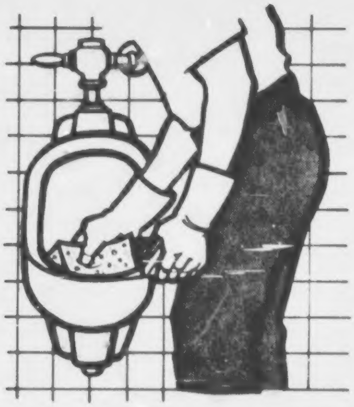


Figure 4-6. Detailed Job Sheet, Daily Cleaning of Urinals

DETAILED JOB SHEET
CLEANING SPECIAL EQUIPMENT, FIXTURES AND SURFACES

EQUIPMENT AND FIXTURES
LIGHT FIXTURES

TOOLS AND MATERIALS:
Step ladder or Scaffold
Container for holding dismantled fixtures
2 Pails
Chemical cleaner
Dry cloth
Dust cloth
Metal polish
Sponge or Cloth
Screw driver
Pliers

SUGGESTED METHOD TO USE IN CLEANING LIGHT FIXTURES:

1. *Put 2 gallons of warm water in each pail.*
2. *Add to one pail, 1/3 pint neutral chemical cleaner for the cleaning solution; the other pail of plain warm water is for rinse.*
3. *With tools and materials go to area of light fixtures to be cleaned.*
4. *Turn off electricity at MAIN SWITCH.*
5. *Set up ladder or scaffold with container fastened to platform near one side of first fixture in first row.*
6. *Climb ladder or scaffold with caution.*
7. *Loosen set screws holding shade or egg crating; use screw driver or pliers if too tight.*
8. *Remove shade or egg crating and lamp and place in container on platform.*
9. *Dust fixture with treated dust cloth.*
10. *Polish fixture; if discolored, use metal polish.*
11. *Carry shade or egg crating and lamp down ladder carefully.*
12. *Rinse shade or egg crating and lamp by dipping in rinse bucket.*
13. *Dry shade or egg crating with dry cloth.*
14. *Using precaution, climb ladder with shade and lamp and carefully place in container.*
15. *Replace lamp. Replace shade or egg crating to original position.*
16. *Tighten set screws snugly.*
17. *Climb down ladder and move to next fixture working progressively to end of row. Start second row from end just completed.*
18. *Change water as it becomes soiled.*
19. *Clean and store equipment properly for next use.*

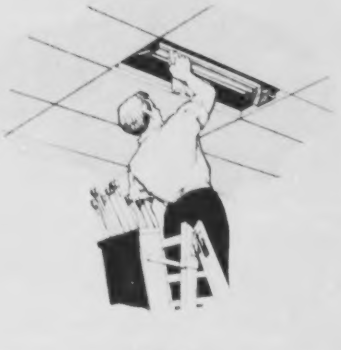


FIGURE 4-7

Figure 4-7. Detailed Job Sheet, Cleaning of Light Fixtures

DETAILED JOB SHEET
CLEANING PROCEDURES FOR BUILDING AREAS

SPECIFIC AREAS
CLASSROOMS

TOOLS AND MATERIALS: *Treated dust cloth, Treated hand duster,*
Cloth untreated, Plastic whisk broom,
Trash receptacle, Dust mop, Counter brush

1. *FIRST, HAND DUST according to proper method and following this pattern:*
   1) *Beginning on side at entrance, dust horizontal surfaces and all furniture across every aisle and work toward the window wall.*
   2) *Dust window sills, secure windows and adjust shades or drapes.*
   3) *Dust horizontal surfaces along window wall.*
   4) *Dust horizontal surfaces along entrance side.*
   5) *Dust inside face of door.*
   6) *Clean chalk troughs into waste basket; empty pencil sharpeners, ash trays into waste basket.*
   7) *Empty waste basket into trash receptacle.*
   8) *Return waste basket to position.*
   9) *Care for and store tools and materials for next use.*

2. *SECOND, DUST MOP FLOOR according to proper method and following this pattern:*
   1) *Starting at entrance, sweep forward across front of room to window wall.*
   2) *Move first row of furniture away from window wall side.*
   3) *Sweep down window wall side leaving debris at rear of room.*
   4) *Sweep space cleared of furniture toward front of room.*
   5) *Return each piece of furniture to its original position and sweep aisle space as each is moved back in position while working toward rear of room.*
   6) *Repeat steps for succeeding rows until room is complete, always leaving debris at rear of room.*
   7) *Sweep small piles of debris from rear of room to door.*
   8) *Pick up and deposit debris in receptacle using dust pan and counter brush.*
   9) *Care for and store tools and materials until next use.*

Figure 4-9. Detailed Job Sheet, Cleaning of Classrooms

Figure 4-9.

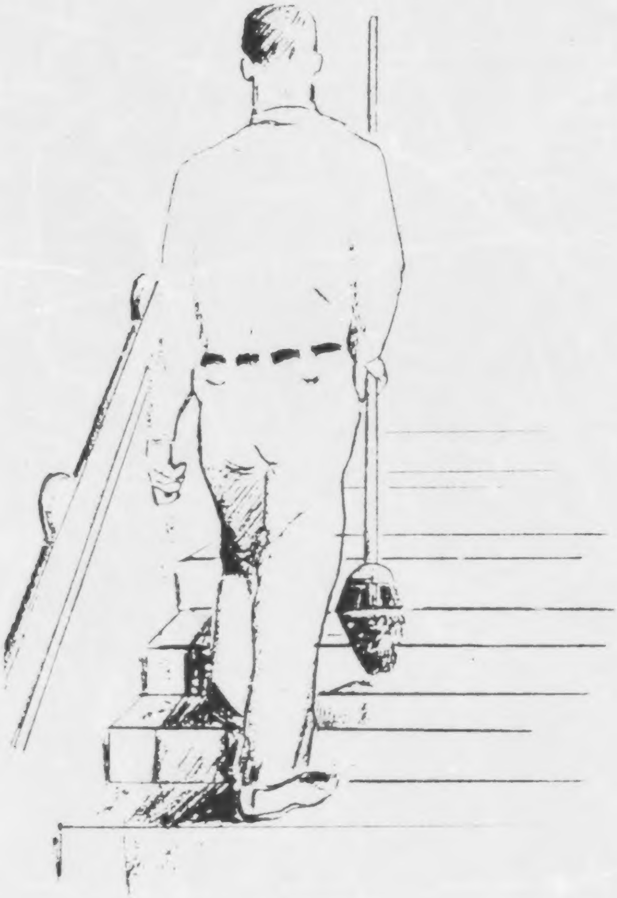
HOW TO BRUSH SWEEP A STAIRWAY

Your stairways, like your hallways, are inspected by everyone who comes into your building. As a visitor to the university walks up the stairs, he can't help but look at the treads and corners. If they look clean, he will know that we take pride in our work here.

The tools you usually use in cleaning a stairway are:

18" floor brush
Dust pan
Counter brush
Wax type sweeping compound
Putty knife
Treated dustcloth

Take your tools with you to the stairs you are going to clean. Park the waste container off to one side at the foot of the stairs, out of the way of traffic.



Carry yours floor brush and sweeping compound up the steps. As you go up, sprinkle a little compound near the left end of each step, as shown in the drawing.

Don't throw compound in corners. You'll have a hard time getting it out.

Then sweep the stairs using the following method. These directions are for right-handed caretakers. If you're a southpaw, use the left side when it says right and the right side when it says left.

Now stand below the top step. Your brush handle points to your right and the brush head reaches into the left end of the step.

NOTE: On open stairs, always sweep towards the wall, away from the stairwell, so the dirt and compound don't fall over the edge. Do this regardless of whether you are left-handed or right-handed.

Pull the dirt out of the end of the step with your brush.

Pull the brush along the whole step from left to right.

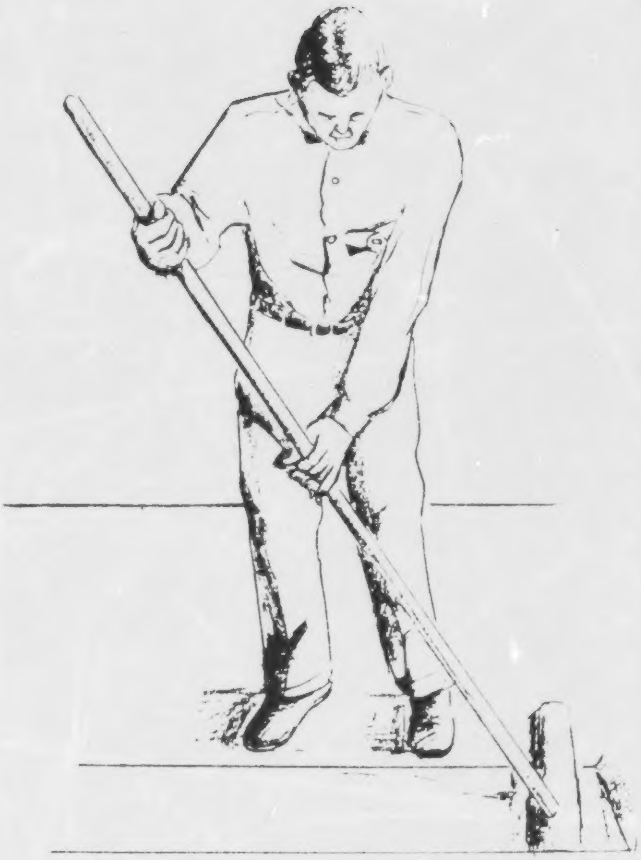
On round-cornered steps, pull the dirt out of the right end of the step by turning the brush at the corner. This lands the dirt on the steps below.

On square-cornered steps, pull the dirt out of the left end of the step by pulling the brush toward you at right angles to the riser. Then sweep from left to right, making a curving stroke around the right end corner.

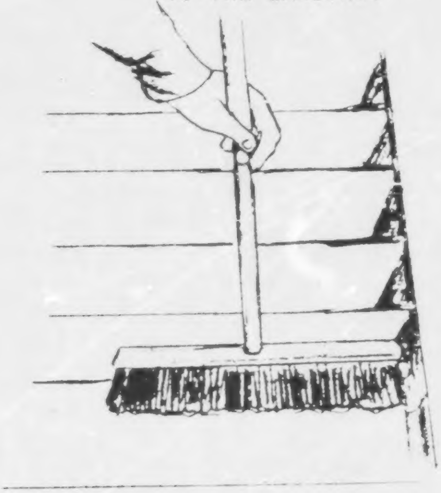
Give your brush a shake and set the end of it in the right end corner of the step with the head flush against the riser. Pull out the dirt onto the step below.

Back down the stairs and do the same thing with each step.

On stairs with steel-ribbed threads, you must use a counter brush to get dust out of the cracks. Sweep the same way you do with a floor brush.



CAUTION: BE CAREFUL AS YOU WALK DOWN BACKWARDS. MAKE SURE YOU'RE ON THE NEXT TO THE LAST STAIR BEFORE YOU TAKE THAT FINAL STEP TO THE LANDING!



When the last step is swept, pull the dirt into a pile and pick it up with your dust pan and floor or counter brush. Dump it in the waste container.

Take your treated dustcloth out of your pocket. Walk back up the stairs, carefully wiping under the handrail and the ballusters or latticework below the handrail. Then, as you come down, wipe the top of the hand handrail.

Outstanding contributions to improved custodial services have been made by members of physical plant organizations at many institutions. Training films, publications and improved methods are cooperatively shared with other interested schools. The following men have expressed a willingness to share their materials upon written inquiry:

Hy Adler	University of New Mexico
Max Cavanagh	University of Indiana, Regional Campus Administration
Jack Harroun	University of Illinois
Joe Leverone	University of Minnesota
Ralph Spearly	Pennsylvania State University
Howard Walters	Ohio State University

The key to good classes is good instruction. And the key to good instruction is enthusiasm--the kind that is contagious enough to counter boredom and inspire interest and enthusiasm among the student custodians. Like the effective supervisor, the capable teacher must not only know his material well, but he must also communicate it vividly. To do so, he should use visual aids whenever possible, since people learn more quickly and retain the information longer when they can see it illustrated or demonstrated. Another way to maintain interest is to involve class members as participants in practical demonstrations; such an approach speeds development of practical skills and breaks the monotony that can result from one person talking continuously. Other ways to reduce monotony are to keep the atmosphere light, informal and humorous, and to keep classes short. Forty-five minutes is the recommended maximum. An extensive index of audio-visual aids is included at the end of this chapter, identified as APPENDIX 4-A.

To supplement such training, administrators should prepare or purchase job description manuals. While a text can never replace on-the-job and classroom instruction, it can serve other important needs. It is a readily available reference for the worker who cannot remember all the details of more complicated or less frequent jobs. A good manual will present for each task a numbered "Sequence of Operations" which explains in order each step to be followed. Figure 4-9, for example, is a description of how to brush sweep a stairway. Regular employees will not carry such manuals on their routine rounds, but new workers may need to, and supervisors can use such a complete inventory of operations to instruct new workers and to advise experienced ones.

All the guidelines given above apply to retraining classes, as do the following. Administrators should keep records of the instruction every member of the custodial staff receives. In addition, they should award certificates every time an employee satisfactorily completes another training course. Perhaps insignia could be designed for his uniform to signify the expertise he has acquired. Such touches stress the importance of training to employees and can even motivate them to perform at higher levels.

The importance of motivation has been stressed for several reasons: the high percentage of the cleaning budget that goes to labor costs; the low esteem value of cleaning work; the low education level of most cleaners; the high turnover that plagues most custodial staffs. Because of these problems, motivating employees becomes as important as training and supervising him. How to motivate people is a constant study for behavioral scientists, teachers, advertising executives, management specialists, wives and parents; and this treatise proposes no final solution to the puzzle. It does offer the thought that if all jobs honestly done were considered equally honorable, there would be less of a problem motivating custodians. It also offers the following practical suggestions for custodial administrators faced with this problem.

1. Put the custodian in uniform. This fosters a sense of group identity, a feeling that he functions as a member of a well-organized, efficient work force. Even if the employee has to buy and clean his own uniforms, insist that they always be neat and clean; a sloppy outfit only destroys the image it was intended to create. If the school is able to buy all or part of the uniform, the employee will consider it a money-saving, fringe benefit.

2. Encourage employee participation in management decisions. Ask advice of the cleaners when researching new equipment and materials or when choosing new uniforms. This provides valuable practical input and lets the employee know that his superiors consider his work, skills and advice important.

3. Recognize and reward talent and effort. Recognition can come in the form of certificates for courses completed, hash marks for years of service, badges or placques for merit awards earned. The best reward is increased pay, but where that is impossible these marks of recognition serve to reinforce the desire to achieve.

EQUIPMENT

Adequate equipment is essential to morale, efficiency and economy. If the custodian has to work with shoddy tools, he will infer that his job is not important. If he has to work with tools of the wrong size and type, he will take too long and achieve only substandard results. And if he must by hand do time-consuming work more quickly completed with power tools, he will cost the school money that could be spent elsewhere. The fault in all these cases is not the custodian's, but the administrator's. Unfortunately, the fact that labor costs usually take more than 90% of most custodial budgets, indicates that too many administrators have been lax about researching, justifying and purchasing proper equipment.

At small schools, the equipment problem can be especially acute. The cleaning list at such institutions usually consists of a variety of jobs, no one of which covers a large area. Reluctant to burden their meager budgets with substantial expenditures for equipment, many administrators fail to investigate fully, automated cleaning systems developed by the cleaning industry. Instead, they struggle along with the manual system they inherited, when a few purchases might considerably lighten the heavy cost load for labor.

With changes in cleaning technology developing so rapidly, every physical plant department should assign one man to review current publications and to investigate new developments that might prove economical in the long run. For asssitance, this equipment supervisor or purchasing agent can turn to the National Association of Educational Buyers, 11 Cantiaque Rock Road, Westbury, New York 11590. He can also turn to the company representatives that let them develop justifications for new purchases.

For his own calculations, he might try the formula developed by the National Association of Bank Auditors and Controllers. They estimate that every daily savings of ten minutes labor by a $5,000 a year employee justifies $1,000 expenditure for equipment.

In appraising expensive equipment, administrators at small schools should pay special attention to the machine's versatility. Some floor cleaning pieces, for example, can clean, scrub, buff and even vacuum. Every additional job that a tool can handle bolsters the economic justification for purchasing it. Some of the greatest economies can come in the area of floor maintenance, a job that consumes 30% to 40% of the custodial budget.

Other factors to watch are size and standardization. Before settling on a particular brush, broom or machine, work through the mathematics for each size available. A 19-inch disk floor machine, for instance, may cost 15% more, but it will cover 25% more area. The size of the equipment must also be correlated with characteristics of the area. A 48-inch broom will obviously cover twice as much space as a 24-inch broom, but it may prove too cumbersome for cramped hallways and stairs. Standardization is important because it simplifies repair and replacement of key parts. It also reduces stockroom costs and confusion, since parts for only one type of each machine need be stored. According to one expert, standardization is valuable enough to justify giving those companies featuring it a 5% to 10% advantage in a competitive bidding situation.

In a limited survey of small schools the following basic list of custodial equipment was recommended. Purchases would follow the priority listing shown:

1. Floor machines, 18"
2. Vacuum cleaner, domestic type
3. Vacuum cleaner, industrial type with attachments
4. Floor machine, large, capable of scrubbing large areas (gymnasiums)
5. Wall washing machine
6. Carpet pile-lifter machine

LABOR-SAVING DESIGNS AND PRACTICES

Another way to control the high cost of custodial labor is to insure that all new buildings feature "built-in cleanability." Unfortunately, sanitation requirements rank rather low on the priority lists of most architects and engineers. One expert, Edwin Feldman of Service Engineering Associates, estimates that "No more than 1 per cent of the architects in this country have any conception of how the cleaning is done in the building they design." Most apparently assume that cleaning methods and technology have simply stagnated since they left school twenty years ago. The last two decades, however, have seen labor costs more than double, and custodial experts have responded with numerous innovations in methods, equipment, and building design and materials. To reap the savings inherent in these innovations, the custodial administrator must assert himself vigorously during the design stage.

His first step should be to provide the architect with a checklist of essential facilities and economical design features. The second step is to insist on plan review at every important phase of the design process. In compiling his checklist he might consider the following items.

FLOORS

Avoid floors requiring hand maintenance or care by other than average custodians.

Along corridors, avoid recesses and projections.

Insist that concrete subfloors be machine trowelled and properly cured with all depressions and high points corrected before the application of resilient tile. Such irregularities wear more quickly and increase maintenance costs.

Install floor drains in all washrooms.

Avoid floors that meet at different levels. Flush joints are preferred; if a difference in elevations is unavoidable, then choose ramps with nonskid surface instead of steps.

For wall bases use scrub-free material, cove design and rounded joints.

WALLS

Use glazed materials on walls of abuse-prone hallways, stairways, washrooms, kitchens and custodial closets.

Require paints that are durable, washable, light reflective and light in color. Where decorative effects are needed, try plastic wall coverings with the proper flame-spread ratings.

In general, select materials that can be dusted as well as wet-cleaned.

CEILINGS

Gypsum base acoustical tile is better than softer materials. Hard plastered ceilings covered by high quality enamel are best for food service and washroom areas. Health departments usually prohibit acoustical treatments for these ceilings.

OPENINGS

Walkways leading to doors should be of hard material and properly drained to prevent tracking.

Use matting or walk-off rugs at entrances to trap soil.

Choose flush rather than panelled doors to prevent collection of dust.

Remember that translucent or tinted glass is easier to maintain than transparent glass.

Caulking should be smooth and continuous.

To eliminate painting, select aluminum window framing instead of wood or steel.

In multistory structures, consider a permanent device for window washing. At the very least, provide lugs for window washers' safety belts.

For minimum maintenance, use marble or slate window sills.

FURNISHINGS AND EQUIPMENT

Dispensers and cabinets should be large enough to provide at least a full day's requirements; double dispensers for holding a reserve supply are most effective and reduce waste.

To permit rapid cleaning and prevent damage to equipment, hang fixtures such as urinals, ash trays, and water fountains on the wall.

CUSTODIAN SERVICES are inherent to the operations of buildings, and proper service areas must be considered WITH ALL OTHER AREAS DURING THE PROGRAMMING AND PLANNING STAGES of each building.

Universally accepted standards have yet to be set for custodian closets and storerooms. However, certain criteria for size, shape, location, and special appurtenances have been developed which are compatible with present cleaning procedures and today's cleaning equipment.

Comprehensive custodian operations encompass three major areas:

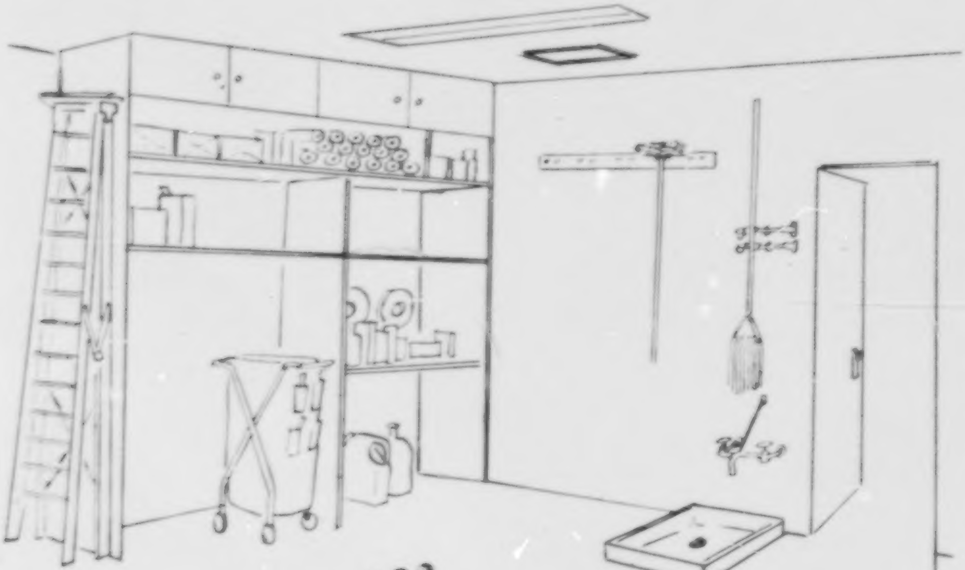
1. CUSTODIAN CLOSETS

2. CUSTODIAN STORAGE AREAS

3. TRASH DISPOSAL SYSTEMS

1. CUSTODIAN CLOSETS should be planned to function primarily as the WORK ROOMS of the men and women responsible for cleaning the interior surfaces of the building. We, at the University of New Mexico, have developed the following criteria for our custodian closets:

CUSTODIAN CLOSETS SHOULD HAVE:



RECESSED LIGHT FIXTURES (to allow for clearance of long broom and mop handles) providing 75 F.C. of light.

ADEQUATE VENTILATION FACILITIES.

SLOT FOR A LADDER.

PEGS for storage of rotary brushes.

HANGERS for wet mops over the sink.

HANGERS and WALL SPACE for dust mops and brooms.

HARD SURFACE WALLS—impervious to water.

SHELVES in closet to accommodate supplies in case lots, and to allow for storage of liquids in original 5- or 6-gallon containers.

A 36" DOOR that swings OUT, not into the room.

HOT and COLD WATER OUTLETS not less than 24" above a FLOOR TYPE BASIN. Basin curb should be 6" minimum above the floor.

A grounded duplex OUTLET in "open" wall, not behind shelves.

FLOOR SPACE for large machines.

LOCATION OF CUSTODIAN CLOSETS IS *VERY IMPORTANT!*

- Custodian closets should be centrally located.
- There should be no area in a building more than 150 feet in walking distance from a "wet" closet.
- In a school building each custodian closet should not serve in excess of 15,000 square feet.
- Well-planned buildings should have custodian closets on every floor.
- Good locations for secondary custodian closets are: close to elevators . . . close to main pedestrian areas . . . between two restrooms.
    - CRITERIA FOR VERTICAL TRANSPORTION

1. There should be an elevator in every multi-storied building.
2. The elevator should land on every floor including the basement.
3. This elevator should be available to custodian and maintenance personnel.

A PROPER WORK ROOM IS INDISPENSABLE TO THE MORALE AND EFFICIENCY OF THE CUSTODIAN.

WE CONSIDER IT POOR PLANNING TO LOCATE A CUSTODIAN CLOSET:

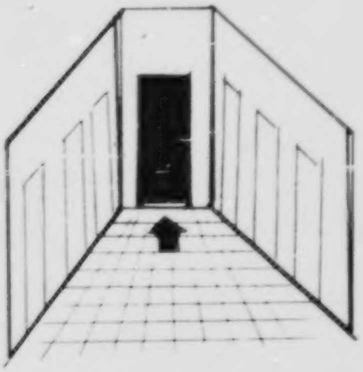
AT THE DEAD END OF A CORRIDOR. A situation such as this results in many unnecessary steps for the custodian.

ON A STAIR LANDING. A stair landing closet would cause the custodian to always carry utensils and equipment up and down stairs.

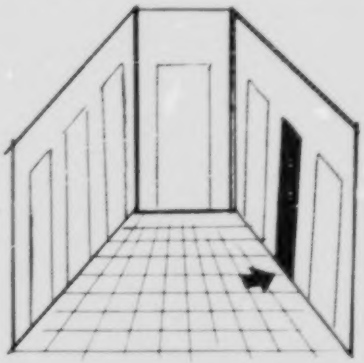
INSIDE ANOTHER ROOM (unless that closet serves only that room).

UNDER STAIRWAYS. Low ceilings and narrow dimensions are hard to ventilate.

IN NARROW SPACES. The custodian must move his equipment into the hall to utilize a narrow room.

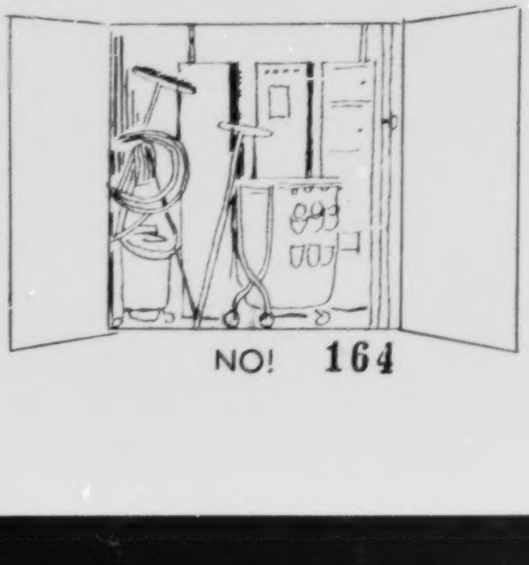


LEAST EFFICIENT



MOST EFFICIENT

TELEPHONE SWITCHING GEAR, ELEVATOR CONTROLS, ELECTRIC PANELS, OR OTHER SERVICE FUNCTIONS ARE NOT COMPATIBLE WITH CUSTODIAN OPERATIONS, AND SHOULD NOT BE LOCATED INSIDE CUSTODIAN CLOSETS. . . . OPENINGS TO PIPE CHASES OR MECHANICAL EQUIPMENT AREAS SHOULD NOT BE LOCATED INSIDE CUSTODIAN CLOSETS.



NO!

Use soap dispensers with metal or plastic containers that may be refilled without spilling.

Metal, plastic and composition materials are more easily cleaned than wood furniture.

Lockers should be placed on concrete or ceramic base so soil cannot be trapped underneath, and their tops should be slanted for easy cleaning.

Place waste receptacles immediately adjacent to areas where waste is created, using liners and covers for odorous or edible material.

CUSTODIAL FACILITIES

Provide adequate sources of both hot and cold water throughout the building as well as sufficient electrical outlets in halls and stairways for custodial use.

Be sure custodial closets and lockers are adequate in number and size and are properly located. Devise a standard layout to provide storage for all reserve supplies and to facilitate laundering, treating and hanging tools such as dust cloths, dust mops, and wet mops. Figure 4-10 enumerates and illustrates criteria for custodian closets as recommended by the University of New Mexico Physical Plant Department.

CONTRACT CLEANING

One way to eliminate most of the administrative headaches discussed so far in this chapter is to hire a private contractor to handle all or part of the custodial load. Most custodial administrators consider this option at some point--often when faced with a major expansion or revamping of their operations. Private firms are often able to provide better service than an in-house operation and to do so at a lower cost. Through extensive time-and-motion studies, specialized companies are able to engineer carefully planned housekeeping programs that eliminate much of the waste that can develop in an in-house cleaning operation. Before deciding whether to employ a contractor, the administrator should analyze his existing operations and evaluate the following advantages and disadvantages.

The primary advantage is the one mentioned above: A contractor will take over administrative tasks such as staffing, scheduling, supervision, and training. A good firm can manage these tasks more efficiently than can a small school with a cleaning staff of less than 10 employees. Such a service can also prove economical for larger schools with widely scattered buildings and for those unable to find enough employees.

The primary disadvantage, at least under certain conditions, can be a deterioration in cleaning quality. The inescapable fact about contract cleaning is that making a profit is the primary goal of all commercial firms. Maintaining the best environment for education will always be secondary to this end. In order to maximize profits, such firms face a constant temptation to cut services as much as possible. (And many of them succumb.)

Additional disadvantages include less flexibility, delays in service for unusual or emergency jobs, charges for "extras," less control over the type of individuals hired for the work, and additional security problems.

In general, large universities are less likely to benefit from contract services than small colleges, but even they may find it profitable to supplement their on-going, in-house service with some contract work. Many schools contract out dangerous jobs like washing upper story windows as well as the more specialized tasks like cleaning radiation areas. This kind of arrangement allows the school to bring highly trained personnel to the campus for difficult projects and simultaneously retain an institutional staff for regular and emergency cleaning.

CONTRACT SPECIFICATIONS

Hiring a contractor entails taking certain precautions. The most important is preparing a set of detailed specifications covering all facets of the job, including how, when, and by whom the work is to be done. To prepare these specifications, the administrator should first compile a complete inventory of areas to be cleaned and specify standards to be achieved in each. Such a survey can also provide him with a realistic price estimate to use in evaluating all bids submitted. APPENDIX 4-B is a sample specification for competitively bidding contract cleaning.

He should also evaluate the contractor's integrity and competence as carefully as his price. Check his references, financial status, previous work, training programs, personnel, office and working methods. Double-check any bid that is dramatically lower than all others. If the low bid cannot be traced to some economy in methods, think twice before making the award. If the contractor will be forced to cut services in order to make any money off the job, then it would be wiser to hire someone with a reputation for responsible performance. After the contract award, some member of the physical plant staff should be assigned the task of continually inspecting the contractor's work to insure that he is complying with all provisions of the contract.

CONSULTANTS

Administrators interested in revising their in-house cleaning staff or of switching to contract cleaning should consider hiring housekeeping consultants. Experts can help because they may know more about cleaning methods, materials and technology than an institutional administrator. Increasing specialization and the rapid rate of technological innovation make it almost impossible for even the hardest working administrators to find enough time away from the daily tasks of managing an on-going operation to research completely current developments in the field. The able administrator will recognize his own limitations and bring in the experts when he is not satisfied with his operations.

A few guidelines should be followed for hiring consultants. The college should find a disinterested expert, a person who has no connection with commercial contractors or manufacturers of cleaning equipment or materials. He should be a recognized authority with broad experience in college and university cleaning, and should be willing to calculate his fees on the basis of actual engineering time involved rather than on what he thinks the traffic will bear. In short, he should be a professional.

Having found such a man, the client should ask him to examine all principal levels: management, supervision and labor. He should provide creative analysis accompanied by proposals for eliminating shortcomings he might discover.

A final sad fact about custodial work: It is largely a thankless enterprise. Most students, faculty and staff notice only the poor and the outstanding work. The former they complain about, the latter they take for granted. Which is unfortunate, since a clean school is never a simple accomplishment. As we have seen cleanliness always costs more than money; it requires intelligent management, constant research and lots of hard work. A well organized program will produce clean buildings and reduced costs. The former means an environment more appropriate to the process of education, and the latter means more money to spend on it. These remain goals worth striving for, even though their realization brings only silence for praise.

APPENDIX 4-A
pp. 168-190

Technical Information REPORT

Institute of Sanitation Management

1710 DREW STREET • CLEARWATER, FLORIDA 33515 • (813) 446-1674

THIS ORGANIZATION IS NOW KNOWN AS
ENVIRONMENTAL MANAGEMENT
ASSOCIATION

INDEX TO VISUAL AIDS FOR ENVIRONMENTAL SANITATION AND MAINTENANCE MANAGEMENT EDUCATION AND TRAINING

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Continuing education and training is the hallmark of a professional. Our society realizes that Environmental Sanitation & Maintenance Management is a professional activity, and certainly members of the Institute of Sanitation Management have earned that distinction.

In recognition of this fact and as a service to its members, ISM presents this listing of some 300 films and audio-visual aids for Environmental Sanitation and Maintenance Management Education and Training. This is the most concise and thoroughly researched listing ever made available to the Environmental Sanitation and Maintenance Manager. We urge you to take advantage of it in planning and implementing your training program.

Besides those sources listed, there is a wealth of information to be found in local and state colleges and universities. Contact the institution nearest you for more information.

Some visual aids in this index are available on a rental or sales basis only. For specific cost information, contact the source directly.

We sincerely trust that this index will serve as a basic requirement in meeting the challenges of an ever-expanding profession; and that it will lead to "a better environment through a better-informed environmental manager." To this end, we dedicate our efforts.

Permission for use of this material granted by
Harold C. Rowe, Executive Director

(Editor's Note:)

This is the third edition of the INDEX TO VISUAL AIDS FOR ENVIRONMENTAL SANITATION AND MAINTENANCE MANAGEMENT EDUCATION AND TRAINING. It contains a selected, comprehensive listing of 337 audio-visual aids covering 47 subjects having special application to Environmental Sanitation Education and Training.

While a listing does not constitute endorsement of any particular film, the Institute is confident that this INDEX will prove especially valuable as a training aid in your search for more efficient operations and better employee relations.

Orders for films, whether on a free loan, rental or sales basis, should be made direct with the source indicated with each film. The Institute is not a source of films.

TABLE OF CONTENTS

How to Use this INDEX 170

General Notes on Film Usage 170

Index to Films by Subject 171-172

Film Listings 173-187

Source Index to Films 188-190

HOW TO USE THIS INDEX

1. Films are grouped by Subject Matter. (See pp. 171-172)

2. Films are also indexed alphabetically by Title.

3. Sources of films are identified in each film listing (see pp. 188-190) by alphabetical code. The source index of distributors is contained on pages

4. Symbols used in film listings to indicate size and type of film are:

   MP - Motion Picture
   FS - Film Strip
   TR - Overhead Transparency
   TFR - Television Film Recording
   VTR - Video Tape Recording (closed circuit television)
   16mm - 16 millimeter film
   35mm - 35 millimeter filmstrip or slides

   A SAMPLE LISTING AND SYMBOL INTERPRETATION IS AS FOLLOWS:

   THE WINNING COMBINATION
   MP, 16mm, Sound, Color, 10 Mins.
   Tackles the difficult supervisory job of motivating subordinates to cooperate with the company's efforts to reduce waste and control costs. (BNA)

   LINE 1 : Title of film (and Film Number if available)
   LINE 2 : Type and size of film, sound or silent, black & white or color, and running time in minutes.
   LINE 3 : Description of film contents and film source (in paren.)

5. Films are classified under the heading in which it is felt they have the greatest bearing.

GENERAL NOTES ON FILM USAGE

1. Rental and purchase prices of films fluctuate and, therefore, are not included.

2. Films for loan or rental should be requested well in advance of the scheduled showing. When ordering, include alternate showing dates as well as the Film Number (if applicable).

3. Check your projection equipment before ordering films. Be sure you have the right equipment for the right film (i.e. filmstrips cannot be shown on motion picture equipment). Improper equipment or planning will damage and delay your program and purpose.

INDEX TO FILMS BY SUBJECT

Bacteriology 173

Collective Bargaining
  see Training-General

Communications 173
  see also Human Relations, Training

Community Relations 174

Computers
  see Data Processing

Creativity
  see Training-General

Data Processing 174

Detergents 174

Discipline
  see Personnel Management

Executive Development
  see Training-Management

Floor Maintenance
  see Maintenance-Floors

Food Sanitation 174

Of General Interest 175

Handicapped Personnel 175

Health 175

Housekeeping
  General 187
  Hospital 176
  Hotel 177

Human Relations 177
  see also Communications, Personnel Management, Training

Institute of Sanitation Management 177

Job Analysis 177

Management Development
  see Training-Management

Man and His Environment
   General 177
   Air Pollution 178
   Water Pollution 178

Maintenance
   General 179
   Floors 179
   Facilities 179
   see also Sanitation

Material Handling
   see Safety

Performance Rating
   see Training-General

Personnel Management 180
   see also Human Relations, Communications, Training

Pest Control 181

Plant Layout and Construction 182

Rest Room Sanitation
   see Sanitation-Facilities

Public Relations
   see Community Relations

Safety
   General 182
   Fire 183
   First Aid 183
   Material Handling 183
   Safety Programs 183

Sanitation
   General 184
   Facilities 184

Suggestion Systems 184

Training
   General 184
   Induction and Orientation 185
   Management. 135
   Supervisory 186

Waste Disposal
   see Plant Layout and Construction

BACTERIOLOGY

AIR SAMPLING FOR MICROBIOLOGICAL PARTICULATES (M-926)
MP, 16mm. Sound, Color, 11 Mins.
Shows the proper techniques and procedures for sampling air-borne bacteria in hospitals. (NMAC)

AN OUTBREAK OF SALMONELLA INFECTION (M-148a)
MP, 16mm, Sound, Color, 14 Mins.
A study case of a simulated typical outbreak of food-borne illness caused by Salmonella. (NMAC)

AN OUTBREAK OF STAPHYLOCOCCUS INTOXICATION (M-148b)
MP, 16mm, Sound, Color, 12 Mins.
A study case of a typical outbreak of food-borne illness caused by Staphylococcus organisms. (NMAC)

BACTERIA - FRIEND OR FOE
MP, 16mm, Sound, Color, 11 Mins.
Historical background of Bacteriology; characteristics and methods of control. (EBEC)

BASIC BIOLOGY OF BACTERIA (S-174)
FS, 35mm, Sound, Color.
An introduction to bacteriology: characteristics of bacteria; explanation for non-professional audiences (NMAC)

EPIDEMIOLOGY OF SALMONELLOSIS IN MAN AND ANIMALS (M-558)
MP, 16mm, Sound, Color, 15 Mins.
Shows the complex transmission patterns of salmonellosis; suggests means of control. (NMAC)

EPIDEMIOLOGY OF STAPHYLOCOCCAL INFECTIONS (M-355)
MP, 16mm, Sound, Color, 13 Mins.
Traces the epidemiological pattern of staph infection within the hospital. (NMAC)

METHODS FOR THE ISOLATION OF SALMONELLA FROM HUMAN FOODS AND ANIMAL FEEDS (M-553)
MP, 16mm, Sound, Color, 12 Mins.
Demonstrates techniques for the isolation and screening of salmonella from foodstuffs. (NMAC)

MICROORGANISMS THAT CAUSE DISEASE
MP, 16mm, Sound, Color, 11 Mins.
A comprehensive presentation of five kinds of pathogenic microorganisms. (CIF)

PREVENTION AND CONTROL OF STAPHYLOCOCCAL INFECTIONS (M-356)
MP, 16mm, Sound, B&W, 14 Mins.
Analysis of staphylococcal infections in hospitals; emphasizes techniques and improved housekeeping procedures to follow. (NMAC)

YOU AND BACTERIA
FS, 35mm, Sound, Color, 7½ Mins.
Types of bacteria, how they are spread and means of control. (VLI)

COMMUNICATIONS

AVOIDING COMMUNICATION BREAKDOWN
MP, 16mm. Sound, Color, 24 Mins.
Calls attention to warning signals of defective communication. (BNA)

CHANGING ATTITUDES THROUGH COMMUNICATION
MP, 16mm, Sound, Color, 24 Mins.
Understanding change will help create acceptance of new policies. (BNA)

COMMUNICATION FEEDBACK
MP, 16mm, Sound, Color, 24 Mins.
Shows that effective communication is impossible if feedback is ignored, distorted, avoided or simply not perceived. (BNA)

THE EXTRA STEP
MP, 16mm, Sound, Color, 33 Mins.
Emphasizes good business principles in telephone usage. (AT&T)

HOW TO IMPROVE MANAGEMENT COMMUNICATIONS
I. Motivation by Communication
MP, 16mm, Sound, B&W, 26 Mins.
Explores communications as an integra- part of the motivating process. (AMA)

HOW TO IMPROVE MANAGEMENT COMMUNICATIONS
II. Communications Downward
MP, 16mm, Sound, B&W, 20 Mins.
Develops an understanding of the importance of downward communications, particularly in increasing employee confidence and awareness. (AMA)

HOW TO IMPROVE MANAGEMENT COMMUNICATIONS
III. Communications Upward
MP, 16mm, Sound, B&W, 26 Mins.
Identifies and analyzes common blocks to upward communications; helps apply a new approach in conveying information to top management. (AMA)

HOW TO IMPROVE MANAGEMENT COMMUNICATIONS
V. On Listening
MP, 16mm, Sound, B&W, 11 Mins.
Designed to challenge your listening ability with an actual test. (AMA)

HOW TO IMPROVE MANAGEMENT COMMUNICATIONS
VII. How to Think and Speak on your feet
MP, 16mm, Sound, B&W, 28 Mins.
Deals with the dynamics of communication with others. (AMA)

IF AN ELEPHANT ANSWERS
MP, 16mm, Sound, Color, 26 Mins.
Demonstrates the hazards that many businesses can face due to inept or careless telephone usage. (AT&T)

A MESSAGE TO NO ONE (MIS-748)
MP, 16mm, Sound, Color, 24 Mins.
An adult philosophical study of "listening" and not listening habits; failure to hear through inattention, boredom and discourtesy. (NMAC)

PERSON TO PERSON COMMUNICATION
MP, 16mm, Sound, Color, 14 Mins.
Analyzes the major barriers in face-to-face communication; specific practical methods for overcoming them. (RFI)

PRODUCTION 5118 (MIS-746)
MP, 16mm, Sound, Color, 30 Mins.
The story of one man's attempts to clearly communicate his ideas to others. (NMAC)

COMMUNITY RELATIONS

COMPANY MANNERS
MP, 16mm, Sound, Color, 30 Mins.
Points out that cooperation of employees in every phase of operation is essential in maintaining good relations between the company and its publics. (AAR)

DATA PROCESSING

GLOSSARY
MP, 16mm, Sound, Color, 10 Mins.
A computer glossary or coming to terms with the data processing machine. (MTPS)

DETERGENTS

HOW WE CAN CLEAN UP DERMATITIS
FS, 35mm, Sound, Color, 12 Mins.
Skin care safety provisions for fighting this occupational disease. (SDA)

THE PURSUIT OF CLEANLINESS
MP, 16mm, Sound, Color, 14½ Mins.
Evolution and importance of cleanliness, how soap and detergents work, their contributions to environmental health. (SDA)

FOOD SANITATION

BASIC SANITATION
Slides, Sound, Color, 15 Mins.
Discusses the and prevention of spoilage and foreign materials in commercially prepared foods. (GPC)

CAN HANDLING
Slides, Sound, Color, 15 Mins.
Information relative to the causes and correction of leaker spoilage due to can handling equipment and procedures. (NCA)

DINING ROOM SANITATION
MP, 16mm, Sound, Color, 8 Mins.
Shows techniques of sanitary food handling in the dining room and stresses the responsibility of personnel to both look and be clean. (NEM)

EVALUATION OF CAN DOUBLE SEAMS
Part I
Slides, Sound, Color, 15 Mins.
A brief history of the sanitary can; the formation of double seams and the terminology used. (NCA)

EVALUATION OF CAN DOUBLE SEAMS
Part II
Slides, Sound, Color, 30 Mins.
Explains the evaluation of the quality of a double seam; protection against leaker spoilage. (NCA)

FOOD SANITATION
Flip Chart for training; 66 pages in color. (NEM)

FOR THE RETORT OPERATOR
Slides, Sound, Color, 40 Mins.
An appreciation of canned food processing and its potential hazards; understanding their job and retort equipment. (NCA)

THE INVADERS
MP, 16mm, Sound, Color, 22 Mins.
Methods of achieving cleanliness in all food handling activities; how to eliminate conditions that cause bacteria build-up. (DIV)

KITCHEN HABITS (M-148g)
MP, 16mm, Sound, Color, 12 Mins.
Shows the importance of developing good habits relating to food sanitation. (NMAC)

A MARK OF QUALITY
MP, 16mm, Sound, Color, 13½ Mins.
Explains what the U.S. Department of Agriculture's grading symbols for meat mean; provides background information for sanitarian.

A MARK OF WHOLESOME MEAT
MP, 16mm, Sound, Color, 18½ Mins.
Shows what it takes to earn the right to display the "stamp of approval" from the U.S.D.A. (USDA)

MORE THAN FOOD (MIS-972)
MP, 16mm, Sound, Color, 23 Mins.
Illustrates the benefits for nursing home patients of good food service procedures. (NMAC)

PLANNED SANITATION
Slides, Sound, Color, 20 Mins.
Explains the reasons for, scope, importance and objectives of sanitation programs in food processing plants. (NCA)

POULTRY HYGIENE: WASTE DISPOSAL, CLEANUP AND BASIC SANITATION (F-199e)
FS, 35mm, Sound, B&W
Describes essentials of waste collection and disposal in poultry processing plant. (NMAC)

PROTECTING THE PUBLIC
I. The Personal Slide
FS, 35mm, Sound, Color, 11 Mins.
Personal sanitary practices that every employee should follow during work, and before coming to work. (NRA)

PROTECTING THE PUBLIC
II. Food Protection
FS, 35mm, Sound, Color, 11 Mins.
Rules for sanitary cooking, serving and storage; emphasis on proper procedures for employees. (NRA)

PROTECTING THE PUBLIC
III. Establishment and Equipment Sanitation
FS, 35mm, Sound, Color, 11 Mins.
Proper cleaning and sanitizing of the equipment and the establishment. (NRA)

SANITATION: RULES MAKE SENSE
MP, 16mm, Sound, Color, 8 Mins.
Specific rules governing heating, washing, cleaning, refrigerating and storing. (NEM)

SANITATION: WHY ALL THE FUSS?
MP, 16mm, Sound, Color, 8 Mins.
Gives foodservice personnel a basic understanding of how food can be contaminated by germs and what steps can be taken to guard the health of the guest. (NEM)

THE TRIP OF FS3679 THROUGH EQUIPMENT LAND
Slides, Sound, Color, 35 Mins.
A"bugs eye view" of good and bad practices in equipment design, sanitation and other areas involved in food processing. (GPC)

USING SQC
Slides, Sound, Color, 17 Mins.
Explains the use, value and meaning of statistical quality control charts in a non-technical manner. (NCA)

YOU AND YOUR JOB (MIS-173)
MP, 16mm, Sound, B&W, 10 Mins
Emphasizes and illustrates the concept that trained responsible men are essential in the processing of safe, pasteurized milk. (NMAC)

OF GENERAL INTEREST

EAGLE HAS LANDED--The Flight of Apollo 11
MP, 16mm, Sound, Color, 28 Mins.
Documents the NASA space mission which successfully landed Americans on the Moom and returned them safely to Earth. (GSA)

EMPLOYING THE DISADVANTAGED
MP, 16mm, Sound, Color, 45 Mins.
Documentary film shows how American business and industry are facing up to the challenge of hard-core employment. (BNA)

ENGINEERING YOUR HEALTH
MP, 16mm, Sound, Coipr, 45 Mins.
Sanitary Engineering as a career. (NMAC)

HERITAGE IN BLACK
MP, 16mm, Sound, Color, 27 Mins.
An eye-opening look at the contributions of the black people in American Life. (EBEC)

HERITAGE OF SPLENDOR
MP, 16mm, Sound, Color, 18 Mins.
Emphasizes the importance of America's outdoor areas as a natural resource for recreation and the citizens obligation to preserve them. (KAB)

OLD AS THE HILLS
MP, 16mm, Sound, Color, 28 Mins.
Depicts man's progress through the years and his dependence upon nature for all that he has discovered in developing our modern way of life. (NOR)

SEVEN-TENTHS OF A SECOND
FS, 35mm, Sound, B&W, 6 Mins.
Illustrates what happens when a car traveling at 55 mph crashes into a solid immovable object. (AT&T)

HANDICAPPED PERSONNEL

EMPLOYEES ONLY (#411)
MP, 16mm, Sound, B&W, 13½ Mins.
Dramatically documents the completely successful integration of the physically handicapped into all phases of a large company's activities. (SMT)

HEALTH

ALCOHOLISM
MP, 16mm, Sound, B&W, 22 Mins.
Causes and developments in excessive drinking; case history. (EBEC)

DESIGN FOR DISCOVERY (AM-1365)
MP, 16mm, Sound, B&W, 20 Mins.
Tells the National Institutes of Health story with emphasis on its organization and function. (NMAC)

DRUG ADDICTION
MP, 16mm, Sound, B&W, 22 Mins.
Tells the story of the hazards of narcotic drugs. Depicts many phases of this problem, particularly with high school youth; case study. (EBEC)

FDA SPECIAL REPORT: DRUG ABUSE--BENNIES AND GOOFBALLS (AM-1362)
MP, 16mm, Sound, B&W, 20 Mins.
A documentary report on the proper use and misuse of amphetamines and barbiturates. (NMAC)

IMPORTANCE OF SANITATION
MP, 16mm, Sound, Color, 22 Mins.
Shows the importance of sanitation in society today, of people employed in sanitation and their critical role in the continuing battle for health and cleanliness. (ISSA)

IT MUST BE THE NEIGHBORS (M-1171)
MP, 16mm, Sound, Color, 14 Mins.
Emphasizes the relationship between good premises sanitation and freedom from mosquitoes, flies, cockroaches and rodents. (NMAC)

THE MINDBENDERS (M-1533x)
TFR, 16mm, Sound, Color, 29 Mins.
Provides information about hallucinogens, presenting current attitudes toward the problem of drug abuse. (NMAC)

OCCUPATIONAL DISEASES (FMIS-672)
FS, 35mm, Sound, Color.
Classification and description of such occupational diseases as lead poisoning, silicosis and dermatoses are discussed. (NMAC)

PUBLIC HEALTH (Series No. 11550)
FS, 35mm, Color
A survey of the scope of public health centers at local, national and international levels emphasizes the concept that germs are everybody's business. (EBEC)

PUBLIC HEALTH ASPECTS OF THE OCCUPATIONAL ENVIRONMENT
FS, 35mm, Sound, Color.
Discusses health hazards faced by workers in various occupations and suggests the implications of these hazards for the public official. (NMAC)

PUBLIC HEALTH PROBLEMS IN MASS EVACUATION (M-220)
MP, 16mm, Sound, B&W, 13 Mins.
Explains the public health problems attending the mass evacuation of an urban population. (NMAC)

A PUBLIC WELL SERVED
MP, 16mm, Sound, Color, 10 Mins.
A training film which stresses the meaning and importance of personal hygiene and behavior while emphasizing the use of single service articles. (PCCI)

RADIOACTIVE WASTE DISPOSAL (M-443)
MP, 16mm, Sound, Color, 24 Mins.
Shows handling of radioactive waste disposal at the National Institutes of Health. (NMAC)

UNSEEN ENEMIES
MP, 16mm, Sound, Color, 32 Mins.
Shows the need for socieal, economic and medical progress in eliminating conditions that foster disease. ([illegible])

THE WATCH ON HEALTH (M-1061)
MP, 16mm, Sound, Color, 13½ Mins.
Describes briefly the historic high points and current programs of the Public Health Service. (NMAC)

YOU AND GOOD HEALTH
FS, 35mm, Sound, Color, 7 Mins.
Illustrates the need to keep physically fit for peak performance. (VLI)

HOUSEKEEPING

HOSPITAL

CHEMICAL DISINFECTION (SPM-816)
MP, 16mm, Sound, Color, 30 Mins
A filmed lecture on chemical disinfection in hospital practice; definitions, factors involved. (NMAC)

THE DIETARY AREA: SPRAY TECHNIQUE
VTR, 25 Mins.
Several methods of utilizing the spray technique to clean and disinfect dietary areas are demonstrated. (AIR)

EASY DOES IT
MP, 16mm, Sound, Color, 22 Mins.
Correct Procedures for general housekeeping in hospitals; humorous comparisons of Right and Wrong methods. (ISSA)

FOCUS ON INFECTION CONTROL
FS, 35mm, Sound, Color, 30 Mins.
Documentary Housekeeping procedures for the control of infection in hospital areas used under varying conditions. (HSCE)

HOSPITAL HOUSEKEEPING
FS, 35mm, Sound, Color, 20 Mins.
Suggests definite housekeeping methods for various cleaning operations in a hospital. (MCP)

HOSPITAL HOUSEKEEPING SERIES
(5 Parts)
FS, 35mm, Sound, Color
A general orientation to the housekeeper's tasks; Cleaning the occupied room, the check-out room, the isolation room; custodial duties. (TC)

HOSPITAL HOUSEKEEPING: Mopping
Two Bucket Method (M-1324)
MP, 16mm, Sound, Color, 9 Mins.
Instructs maintenance personnel in mopping hospital floors. (NMAC)

HOSPITAL HOUSEKEEPING: Wet Pick Up (M-1325)
MP, 16mm, Sound, Color, 7 Mins.
Instructs maintenance personnel in the best method and procedure for cleaning the floor of the operating room. (NMAC)

HOSPITAL SEPSIS--A COMMUNICABLE DISEASE (MIS-551)
MP, 16mm, Sound, Color, 28 Mins.
Designates the many ways by which infection can be spread throughout a hospital. (NMAC)

IT'S YOUR CHALLENGE
MP, 16mm, Sound, Color, 27 Mins.
For hospital housekeepers and aides; procedures and responsibility of their work. (HUM)

MEDICAL ASEPSIS (MIS-961)
MP, 16mm, Sound, B&W, 42 Mins.
Basic principles of medical aseptic techniques used during care of patients infected with a communicable disease are discussed. (NMAC)

THE OPERATING ROOM: SPRAY TECHNIQUE
VTR, 23 Mins.
A procedure for obtaining an aseptic condition in the operating room is demonstrated; step-by-step sanitation methods are shown, including gowning requirements. (AIR)

THE PATIENT'S ROOM: DOUBLE BUCKET TECHNIQUE
VTR, 15 Mins.
Depicts sanitation procedures which will help keep the patient's room free from the dangers of cross infection. (AIR)

TRAINING THE HOUSEKEEPING AIDE
I. Understanding Health Care, Cleanliness and Safety.
TR, 10 Script provided.
Conditions affecting the growth of bacteria; general safety practices. Motion economy; types of isolation. (AHA)

TRAINING THE HOUSEKEEPING AIDE
II. Basic Housekeeping Skills--Floor and Carpet Care
TR, 10, Script provided.
Basic cleaning; dusting, floor mopping and scrubbing; theory of conductive floors; the two-bucket system. (AHA)

TRAINING THE HOUSEKEEPING AIDE
III. Special Housekeeping Tasks--1
TR, 7, Script provided.
Cleaning bathrooms, ceilings, patient units, wall surfaces and windows. (AHA)

TRAINING THE HOUSEKEEPING AIDE
IV. Special Housekeeping Tasks--2
TR, 9, Script provided.
Area cleaning; care and upkeep of equipment, cleaning furniture, linen areas; first aid for stains; handling waste materials. (AHA)

HOUSEKEEPING -

HOTEL

THE MAGIC TOUCH
Part I
FS, 35mm, Sound, Color, 15 Mins.
Shows the importance of the maid's role in a successful operation; correct procedures following standard practices are detailed. (AHMA)

THE MAGIC TOUCH
Part II
FS, 35mm, Sound, Color, 15 Mins.
Continues in detail the making up of rooms and shows how to handle special and emergency situations. (AHMA)

HUMAN RELATIONS

EXAMINING THE WILL TO WORK
MP, 35mm, Sound, Color, 14 Mins.
Aid to supervisors in understanding factors that stimulate people to better job performance. (HSC)

GETTING AHEAD: THE ROAD TO SELF-DEVELOPMENT
MP, 16mm, Sound, Color, 28 Mins.
Motivational documentary for those who wish to encourage self-evaluation, continuing education, on-the-job training and self-development at all levels. (RFI)

THE HERITAGE OF THE UNCOMMON MAN
MP, 16mm, Sound, Color, 28 Mins.
Encourages people to take a bigger look at their potential and their opportunities. (BNA)

I JUST WORK HERE
MP, 16mm, Sound, Color, 17 Mins.
This attitude-formation film encourages your people to create a more favorable organizational image and improve their attitudes toward the job. (RFI)

JUDGING PEOPLE
MP, 16mm, Sound, B&W, 23 Mins.
Explains and illustrates the process of reaching more accurate estimates of ability, personality, intelligence, character and potential. (RFI)

MEANINGS ARE IN PEOPLE
MP, 16mm, Sound, Color, 24 Mins.
Demonstrates how misunderstandings occur by presenting reenactments in typical at-work situations. (BNA)

1104 SUTTON ROAD (MIS-747)
MP, 16mm, Sound, Color, 30 Mins.
Describes how attitude toward a job influences the degree of success achieved. (NMAC)

PLACING THE RIGHT MAN ON THE JOB (OE-156)
MP, 16mm, Sound, B&W, 13 Mins.
Cases of five different workers, unsatisfactory in particular jobs, who are reassigned to other jobs more suitable to their abilities and capacities. (GSA)

THAT'S NOT MY JOB
MP, 16mm, Sound, Color, 26 Mins.
Builds cooperation by encouraging people to learn how their work relates to the work of others and how together they contribute to the purpose of the organization. (RFI)

YOU, YOURSELF, INCORPORATED
MP, 16mm, Sound, Color, 24 Mins.
Demonstrates that the only real development is self-development; motivated men make progress and profits. (BNA)

INSTITUTE OF SANITATION MANAGEMENT

WHAT IS ISM?
Slides, 35mm, Color, Script provided.
A documentary on the history, concept and services of the Institute of Sanitation Management. (ISM)

JOB ANALYSIS

YOUR RESPONSIBILITY TO PATIENTS
FS, 35mm, Sound, Color, 9½ Mins.
The patient will judge the efficiency of the whole hospital by its employees. (VLI)

MAN AND HIS ENVIRONMENT

GENERAL

CITIES IN CRISIS: A MATTER OF SURVIVAL
MP, 16mm, Sound, Color, 18 Mins.
Examines causes, effects, and possible solutions to the problem of air, water and land pollution. Stresses threats to health and existence of man. (UEVA)

CITIES IN CRISIS: WHAT'S HAPPENING
MP, 16mm, Sound, Color, 21 Mins.
Exposes the crass and ugly in contemporary urban life. Deals with traffic jams, be-smogged air, ghettos in the megalopolis. (UEVA)

A DAY IN SEPTEMBER
MP, 16mm, Sound, Color, 28 Mins.
Shows how Federal facilities throughout the country prepare for a civil defense emergency. (OCD)

THE HOUSE OF MAN - OUR CHANGING ENVIRONMENT
MP, 16mm, Sound, Color, 17 Mins.
Reveals the waste of resources in urban and rural areas; comparison of progress through wasteful methods and intelligent preservation of resources. (EBEC)

LET'S KEEP AMERICA BEAUTIFUL
MP, 16mm, Sound, Color, 14 Mins.
Presents the litter problem against a backdrop of some of the country's most beautiful landscapes. (KAB)

THE LITTERBUG
MP, 16mm, Sound, Color, 8 Mins.
Donald Duck is the star of the picture which shows various types of litterbugs in action. (KAB)

NO TIME FOR UGLINESS
MP, 16mm, Sound, Color, 26½ Mins.
Some good and not-so-good features of American Cities. (AIA)

TAKE A SECOND LOOK (#1297)
MP, 16mm, Sound, Color, 14½ Mins.
A tour through the rendering industry to show the modern plants and processes that transform waste material into end products used by manufacturers to make soap, shoe polish and other products. (SMI)

THE THIRD POLLUTION (No. AM-1904)
MP, 16mm, Sound, Color, 23 Mins.
Depicts existing practices of solid waste disposal and describes various approaches to improving these practices. (NMAC)

WEALTH OF THE WASTELAND
MP, 16mm, Sound, Color, 27 Mins.
Story of research to recycle waste minerals and metals from domestic trash and refuse. (BOM)

WATER POLLUTION

CLEAN WATER IS EVERYBODY'S BUSINESS (FMIS-825)
FS, 35mm, Silent, Color
Describes development of the nation's water pollution problem, measures taken to correct the situation. (NMAC)

IT'S YOUR DECISION--CLEAN WATER
MP, 16mm, Sound, Color, 14½ Mins.
An up-to-the-minute report on the nation's water crisis: the effect of people, prosperity and products. (SDA)

LIVING WITH TODAY'S WATER
MP, 16mm, Sound, Color, 26 Mins.
Explores the causes and effects on today's water pollution; how a waterworks operation removes some of it. (MIPS)

THE NEW RIVER
MP, 16mm, Sound, Color, 23 Mins.
Shows the use of water in industry and how it returns to the stream or river in a usable condition. (AFA)

PENNIES FOR HEALTH
MP, 16mm, Sound, Color, 13½ Mins.
Community project for pollution control. (NWI)

PIPELINE TO THE CLOUDS
MP, 16mm, Sound, Color, 33 Mins.
Comprehensive exploration of the sources of water, water treatment, and ways of supplying an abundant quantity of water. (NAPHCC)

PURE WATER AND PUBLIC HEALTH
MP, 16mm, Sound, Color, 28 Mins.
Dramatizes the water supply problems in a hypothetical community. (CIPRA)

THE RIVER MUST LIVE
MP, 16mm, Sound, Color, 21 Mins.
A frightening study of what happens when a river is overloaded with more waste than it can absorb and the consequences to those who have to depend on it. (SOC)

TROUBLED WATERS
MP, 16mm, Sound, Color, 28 Mins.
Pollution in the U.S. (USSPWC)

WATER--WEALTH OR WORRY FOR AMERICA
MP, 16mm, Sound, Color, 24 Mins.
Emphasizes long-term advance planning necessary for enough water; facts on industrial usage; the growing demand for water and restricted usage. (CIPRA)

AIR POLLUTION

AIR OF DISASTER (M-1419-X)
MP, 16mm, Sound, Color, 50 Mins.
A visit to the U.S. Public Health Service Air Pollution Laboratory at Cincinnati, Ohio, demonstrates research on auto exhaust emissions. (NMAC)

AIR POLLUTION AND YOU (F-1528-X)
FS, 35mm, Color, Guide provided.
Outlines the basic problem of air pollution, its principal effects on health and property and some approaches to its control. (NMAC)

THE ANSWER IS CLEAR
MP, 16mm, Sound, Color, 14 Mins.
Discusses the aspects of air pollution and progress made in reducing exhaust smoke and odor. (MTPS)

BEWARE OF ILL WINDS (F-1745-X)
FS, 35mm, Color, Guide provided
Describes the regional approach to controlling air pollution under the provisions of the Federal Air Quality Act. (NMAC)

BEWARE THE WIND (M-1707-X)
MP, 16mm, Sound, Color, 22 Mins.
The origins and evolution of the world wide affliction of dirty air not only in American cities but in various European capitals as well. (NMAC)

ILL WINDS ON A SUNNY DAY (MIS-984)
MP, 16mm, Sound, Color, 29 Mins.
Traces the growth of America from a rural agricultural society to the urbanized, industrial nation of today. Demonstrates the problem of air pollution. (NMAC)

IT'S THE ONLY AIR WE'VE GOT (M-1431-X)
MP, 16mm, Sound, Color, 25 Mins.
Tells the story of Pittsburgh's continuing fight against air pollution. (NMAC)

ON A CLEAR DAY YOU CAN ALMOST SEE TERMINAL TOWER (M-1712-X)
MP, 16mm, Sound, Color, 22 Mins.
Documentary studying Cleveland's air quality problem in a frank and low-keyed manner. (NMAC)

OUR AIR
MP, 16mm, Sound, Color, 18 Mins.
Explains the major causes and describes the various efforts now being made to minimize air pollution. (MIPS)

THE POISONED AIR (M-1418-X)
MP, 16mm, Sound, Color, 50 Mins.
Representatives from the motor vehicle industry explain Detroit's position with regard to air pollution from cars, trucks, and buses. (NMAC)

SOMETHING IN THE WIND (TFR-1308-X)
MP, 16mm, Sound, B&W, 30 Mins.
This three-part documentary presents a compelling picture of pollution in the twin Kansas City areas. (NMAC)

THIS BUSINESS OF AIR (No. M-1420-X)
MP, 16mm, Sound, Color, 30 Mins.
A documentary on air pollution in the St. Louis area. (NMAC)

TO CLEAR THE AIR
MP, 16mm, Sound, Color, 22 Mins.
The roles that industry, government and individuals can play in the fight for cleaner air. (APE)

WITH EACH BREATH (M-1430-X)
MP, 16mm, Sound, Color, 30 Mins.
Against a background of the general air pollution problem, the film depicts New York State's approach to air pollution. (NMAC)

MAINTENANCE -
GENERAL

AUTO-SCRUBBERS
MP, 16mm, Sound, Color, 9 Mins.
Discussion by building operations staff members about two types of auto-scrubbers. (VA)

THE BIG DIFFERENCE
MP, 16mm, Sound, Color, 17 Mins.
Research behind maintenance products. (SCJ)

CARPET LIFE IS IN THE CARE
FS, 35mm, Sound, Color, 10 Mins.
Classification of Carpet Dirts, methods of removal on a daily and periodic basis. (HSCE)

FOR SAFETY'S SAKE
MP, 16mm, Sound, B&W, 15 Mins.
How to use, inspect and care for portable power drills, grinders, saws and electrical tools. (AAR)

HAND TOOLS
Slides, Color, Script provided.
Illustrates carrying, storing, maintaining, and using common hand tools. (NSC)

HOW TO SELECT THE RIGHT GRINDING WHEEL
MP, 16mm, Sound, Color, 30 Mins.
Grinding wheel markings clearly explained; also step-by-step procedure in selecting wheels. (NOR)

IT'S THE BREAKS (#2302)
MP, 16mm, Sound, Color, 13 Mins.
The story of LEXAN polycarbonate sheet for glazing, the toughest transparent material ever developed; benefits for schools, plants and public buildings against vandalism. (SMI)

MAINTENANCE PAINTING: AN ENGINEERING APPROACH TO LOWER COSTS
MP, 16mm, Sound, Color, 26 Mins.
A discussion on the importance of pre-planning and design to insure lower paint maintenance costs. (HI)

MAXIMUM SECURITY
MP, 16mm, Sound, Color, 10 Mins.
Illustrates the role of locking devises in glass doors as they relate to the security of a building. (ARMC)

SEWER CLEANING AND MAINTENANCE
MP, 16mm, Sound, Color, 35 Mins.
Preventive maintenance program on main sewer lines. (RMC)

SYSTEMS, SAVINGS AND YOU
MP, 16mm, Sound, Color, 12 Mins.
Lays the foundation for a study of proper maintenance techniques in general. (KNA)

MAINTENANCE -
FACILITIES

BETTER WASHROOM MAINTENANCE
MP, 16mm, Sound, Color, 9 Mins.
Illustrates importance for establishing regular programs of washroom maintenance. (SCJ)

GREENER ON YOUR SIDE
MP, 16mm, Sound, Color, 23½ Mins.
A professional approach on methods and products used in grounds care, especially grass. (HI)

HEY CHARLIE, IT'S TIME TO WASH THE WALLS AGAIN
FS, 35mm, Sound, Color, 7½ Mins.
A "how to" production to show the user how he can bring speed and efficiency to a disagreeable and time consuming task. (GWC)

AN OUNCE OF PREVENTION
MP, 16mm, Sound, Color, 8 Mins.
Maintenance short cuts to keep floors, walls, desks, and other surfaces clean. (SCJ)

MAINTENANCE -
FLOORS

CARE AND MAINTENANCE OF CONCRETE, MARBLE AND TERRAZZO FLOORS
MP, 16mm, Sound, Color, 19 Mins.
Shows the proper procedure for taking care of hard surface floors. (ISSA)

THE CARE AND MAINTENANCE OF RESILIENT TILE FLOORS
FS, 35mm, Sound, Color, 12 Mins.
Tells the story of the care and maintenance of 5 types of resilient floors. (MCP)

THE CLEANING AND MAINTENANCE OF RESILIENT FLOORS
MP, 16mm, Sound, Color, 22 Mins.
Methods of cleaning and maintenance of resilient floors; sweeping and mopping techniques, operating floor machines and vacuums. (ISSA)

DAILY FLOOR AAINTENANCE
MP, 16mm, Sound, Color, 9 Mins.
Various daily and periodic floor cleaning situations experienced by the building operations janitor. (VA)

FINISHING GYM FLOORS
MP, 16mm, Sound, Color, 8 Mins.
Procedures for eemoving old finishes: sealing, finishing and maintaining gym floors. (SCJ)

FINISHING THE FLOOR
Slides, Color, Script provided.
Illustrated proper maintenance procedures for the application of a floor finish. (SCJ)

THE FINISHING TOUCH
MP, 16mm, Sound, Color, 8 Mins.
Illustrates procedures and equipment for stripping and finishing resilient floors. (SCJ)

FLOOR FINISHING
VTR, 6 Mins.
Shows a technique suitable for the application of a non-buffable floor finish: the spray buff technique for touch-up of scuff marks is demonstrated. (AIR)

FLOOR MACHINES
MP, 16mm, Sound, Color, 5½ Mins.
Shows the safe use of a standard floor machine and includes maintenance and storage procedures. (VA)

FLOOR REFINISHING
MP, 16mm, Sound, Color, 24 Mins.
Outlines the two most common refinishing techniques. (VA)

FLOOR SEALING
VTR, 5 Mins.
A procedure for applying a liquid sealer to a prepared floor is detailed: pitfalls to be avoided are explained fully; two methods of application are demonstrated. (AIR)

FLOORS THAT SAY WELCOME
FS, 35mm, Sound, Color, 14 Mins.
Deals with basic fundamentals of intelligent use and care of equipment in maintaining resilient floors. (GWC)

FLOOR STRIPPING
VTR, 16 Mins.
Two methods of stripping a floor are demonstrated; the double bucket method and the watering can/wet vacuum method. (AIR)

FLOOR WAXING
VTR, 8 Mins.
A complete procedure for waxing a floor with a buffable, slip-resistant, wax is demonstrated. (AIR)

THE INSTALLATION, FINISHING AND MAINTENANCE OF GYM FLOORS
FS, 35mm, Sound, Color, 10 Mins.
The correct installation of gym floors, the procedure for finishing, including painting of the lines, and the maintenance of a gym floor after it is properly sealed. (MCP)

MAINTAINING BUFFABLE FLOOR FINISHES
Slides, Color, Script provided.
Illustrates proper maintenance procedures to correctly maintain buffable floor finishes. (SCJ)

MODERN FLOOR MAINTENANCE
MP, 16mm, Sound, Color, 15 Mins.
Techniques of resilient floor maintenance, including care of equipment. (WGL)

PREPARING THE FLOOR
Slides, Color, Script provided.
Illustrates proper maintenance procedure for preparing floors for finish application. (SCJ)

PROPER CARE OF HARD FLOORS
FS, 35mm, Sound, Color, 30 Mins-
Guide to treatment and maintenance of all types of masonry, brick and stone flooring. (HSCE)

PROPER CARE OF RESILIENT FLOORS
FS, 35mm, Sound, Color, 20 Mins.
Defines types of resilient floors, the tools and equipment needed in sealing, eaxing and maintenance, and the proper cleaning procedure. (HSCE)

PROPER CARE OF WOOD FLOORS
FS, 35mm, Sound, Color, 30 Mins.
Complete steps for scrubbing, refinishing and sealing gymnasiums. (HSCE)

SCOTCH-BRITE SYSTEMS
FS, 35mm, Sound, Color, 20 Mins.
Offers good information on the spray cleaning method of floor maintenance. (3M)

SPRAY BUFFING FOR MAINTAINING FLOOR FINISHES
Slides, Color, Script provided.
Proper maintenance procedures for spray buffing. (SCJ)

THE TREATMENT AND MAINTENANCE OF CONCRETE FLOORS
FS, 35mm, Sound, Color, 12 Mins.
Illustrates the proper method of cleaning, etching and sealing concrete floors and maintenance of those floors after they have been sealed. (MCP)

YOUR TERRAZZO OR OXYCHLORIDE FLOOR AND HOW TO MAINTAIN IT
FS, 35mm, Sound, Color, 12 Mins.
Shows the installation of terrazzo floors, the proper method of cleaning, sealing and waxing of these floors and the maintenance of them after they are put to use. (MCP)

PERSONNEL MANAGEMENT

CALL 'EM ON THE CARPET
MP, 16mm, Sound, B&W, 12 Mins.
Covers the important matter of correcting faults without incurring ill will. (AAR)

A CASE OF INSUBORDINATION
(4 Parts)
MP, 16mm, Sound, Color, 20 Mins. each.
One incident as it is perceived by the employee, the supervisor, a witness and an arbitrator. (RFI)

THE ENGINEERING OF AGREEMENT
MP, 16mm, Sound, Color, 21 Mins.
Demonstrates both directive and non-directive techniques that are basic to obtaining cooperation and handling of differences of opinions. (RFI)

EVERY MINUTE COUNTS (OE 161)
MP, 16mm, Sound, B&W, 10 Mins.
Problems of a new supervisor in handling lateness, loafing, and absenteeism; and how he learns to deal with individual cases. (GSA)

FRAGILE--HANDLE FEELINGS WITH CARE
MP, 16mm, Sound, B&W, 12 Mins.
How workers react to various changes, orders and safety rules. (AAR)

GET A GRIP ON YOURSELF
MP, 16mm, Sound, B&W, 15 Mins.
Motivational film showing how feelings and emotions can undermine determination. (AAR)

THE MARVELOUS MOUSETRAP
MP, 16mm, Sound, Color, 24 Mins.
There are vital relationships between the quality of each individual's work, the size of his company's profits, and the job security of all employees. (BNA)

THE MOTIVATION TO WORK
I. The Modern Meaning of Efficiency
MP, 16mm, Sound, Color, 25 Mins.
Explains why it is no longer efficient to break down jobs into components so simple that "even a child could do it." (BNA)

THE MOTIVATION TO WORK
II. KITA, or, What Have You Done For Me Lately?
MP, 16mm, Sound, Color, 25 Mins.
An in-depth analysis of what the "hygiene" portion of the "motivation-hygiene" theory actually is. (BNA)

THE MOTIVATION TO WORK
III. Job Enrichment In Action
MP, 16mm, Sound, Color, 25 Mins.
Solution to the motivation proglems; demonstrations on how it is done. (BNA)

THE MOTIVATION TO WORK
IV. Building a Climate for Individual Growth
MP, 16mm, Sound, Color, 25 Mins.
Analysis of real growth as compared with mere status symbols as measures of advancement. (BNA)

THE MOTIVATION TO WORK
V. The ABC Man: The Manager in Mid-Career
MP, 16mm, Sound, Color, 25 Mins.
Helps to identify and to overcome the problems of the manager faced with mid-career obsolescence. (BNA)

THE NEW TRUCK DILEMMA
MP, 16mm, Sound, Color, 25 Mins.
Gets the vital message of fairness in decision-making across to your people, using the powerful tool of role-playing in case study. (BNA)

PEOPLE DON'T RESIST CHANGE
MP, 16mm, Sound, Color, 22 Mins.
Tells management how to make needed changes in work procedures by enlisting the cooperation of those affected. (BNA)

THE REAL SECURITY
MP, 16mm, Sound, Color, 24 Mins.
Illustrates the cause and cures of "mental retirement" and organizational lethargy. (BNA)

SHOWDOWN (M-1213)
MP, 16mm, Sound, Color, 13 Mins.
An "open-end" film presenting the problematical situation of the new young supervisor and the older marginal worker. (NMAC)

SOMETHING TO WORK FOR
MP, 16mm, Sound, Color, 30 Mins.
Reveals what work means to people and how managers can motivate employees to improve productivity and raise work standards. (RFI)

THE TROUBLE WITH ARCHIE
MP, 16mm, Sound, Color, 10 Mins.
Covers the subject of constructive discipline. (BNA)

THE WAY I SEE IT
MP, 16mm, Sound, Color, 23 Mins.
Attacks the problems behind job assignments that fail; discusses perceptual differences and their influence on work relations and job performance. (RFI)

PEST CONTROL

AREA POISONING (M-37.1-f(2))
MP, 16mm, Sound, B&W, 9 Mins.
Discusses the uses of such rodenticides as red squill, ANTU, arsenic trioxide. (NMAC)

BIOLOGY AND CONTROL OF THE COCKROACH (M-426)
MP, 16mm, Sound, Color, 14 Mins.
Recognition and control of the cockroad; new insecticides for the control of cockroaches which are resistant to chlordane. (NMAC)

BIOLOGY AND CONTROL OF DOMESTIC FLIES (M-628)
MP, 16mm, Sound, Color, 15 Mins.
Public health importance, biology, environmental control of common species of domestic flies. (NMAC)

BIOLOGY AND CONTROL OF DOMESTIC MOSQUITOES (M-357)
MP, 16mm, Sound, Color, 22 Mins.
Stresses the need for control of domestic mosquitoes. (NMAC)

CHEMICAL BIOCIDES
MP, 16mm, Sound, Color, 6 Mins.
Illustrates the lethal effects of a chemical pesticide. (TGFC)

ENEMIES OF MAN
MP, 16mm, Sound, B&W, 20 Mins.
Live action pictures of household pests. (WKPC)

THE ENEMY IN YOUR HOME (M-911)
MP, 16mm, Sound, Color, 13 Mins.
Explains the epidemiology of dengue and yellow fever, and the biology and methods used in surveying and controlling the yellow fever mosquito. (NMAC)

FLY CONTROL THROUGH BASIC SANITATION (4-090)
MP, 16mm, Sound, Color, 9 Mins.
Shows conditions which favor fly breeding and outlines specific procedures for control. (NMAC)

GETTING THE BUGS OUT
MP, 16mm, Sound, Color, 9 Mins.
The insect problem--where to look for them and how to eliminate them. (SCJ)

HEALTH HAZARDS OF PESTICIDES (M-204)
MP, 16mm, Sound, Color, 14 Mins.
Emphasizes the potential public health hazards resulting from the widespread use of pesticides. (NMAC)

THE HOUSEFLY
MP, 16mm, Sound.
Shows four stages of egg, larva, pupa and adult; activities as disease carrier. (CIF)

INSECT ENEMIES AND THEIR CONTROL
MP, 16mm, Sound, Color, 11 Mins.
The habits, life cycles and physiology of some of the more important insect pests. (CIF)

LIFE CYCLE OF A FLY
MP, 16mm, Sound, B&W, 10 Mins.
Study of a bluebottle fly. (UEVA)

MOSQUITO AND ITS CONTROL
MP, 16mm, Sound, Color, 11 Mins.
Details of the mosquito's anatomy and its breeding and feeding habits. (CIF)

PESTICIDES--FUNDAMENTALS OF PROPER APPLICATION (#758)
MP, 16mm, Sound, Color, 16 Mins.
Outlines the basic working parts of spray equipment from the tank to the nozzle. (SMI)

RAT KILLING (M-37.1-f(1))
MP, 16mm, Sound, B&W, 13 Mins.
Emphasizes three aspects of rat control--sanitation techniques, rat-proofed buildings and rat killing. (NMAC)

RATPROOFING (M-37.1e)
MP, 16mm, Sound, B&W, 10 Mins.
Explains methods and materials to be used in the ratproofing of buildings. (NMAC)

RATS DEFY MAN
MP, 16mm, Sound, 10 Mins.
How rats enter and infest buildings. (WKPC)

RATS, MICE AND YOU
(2 Parts)
MP, 16mm, Sound, Color, 20 Mins.
Covers habits and characteristics of rats and mice; shows control methods. (FWS)

SANITATION TECHNIQUES IN RAT CONTROL (M-37.1d)
MP, 16mm, Sound, B&W, 12 Mins.
Explains the importance of controlling rats by cutting down their food supply; suggest various methods of garbage and refuse storage and removal. (NMAC)

PLANT LAYOUT AND CONSTRUCTION

AIR, WATER AND INDUSTRY
MP, 16mm, Sound, Color, 22 Mins.
Emphasizes industrial waste problems and shows what industry is doing to control disposal.(DOW)

INCINERATION (M-353)
MP, 16mm, Sound, Color, 13 Mins.
Discusses principles of incineration. (NMAC)

LITTER NO MORE
MP, 16mm, Sound, Solor, 8 Mins.
Demonstrates mobilization, plant installation, maintenance and pick up for dumping refuse containers. (MHI)

MUNICIPAL SEWAGE TREATMENT PROCESSES (M-6)
MP, 16mm, Sound, B&W, 13 Mins
Explains processes of sewage treatment. (NMAC)

REFUSE DISPOSAL BY SANITARY LANDFILL (M-228)
MP, 16mm, Sound, Color, 13 Mins.
Construction, equipment, selection of sites, operation of sanitary landfills. (NMAC)

PURE AND SIMPLE
MP, 16mm, Sound, Color, 19 Mins.
Industrial Waste treatment to combat stream pollution, recirculate water, recover by-products. (LBD)

TALE OF THE TWIN CITIES
MP, 16mm, Sound, Color, 25 Mins.
Building and operating treatment plant by two cities. (MSPSD)

TRICKLING FILTERS
MP, 16mm, Sound, Color, 16 Mins.
Construction of a trickling filter using little hand labor without tile breakage. (NCSA)

SAFETY -

GENERAL

ACCIDENTS DON'T HAPPEN
MP, 16mm, Sound, B&W, 11 Mins.
Describes industrial work hazards and shows the dangers of carelessness on and off the job. (AAR)

ACCIDENTS DON'T JUST HAPPEN (MIS-362)
MP, 16mm, Sound, B&W, 14 Mins.
Discusses and demonstrates underlying factors that cause accidents. (NMAC)

ACCIDENT PREVENTION IN NURSING HOMES (MIS-805)
MP, 16mm, Sound, Color, 14 Mins.
Depicts examples of accident hazards in the modern nursing home together with methods of prevention. (NMAC)

BEFORE IT'S TOO LATE
MP, 16mm, Sound, Color 13½ Mins.
Emphasizes the importance of using seat belts in vehicles and subtly stresses the fact that seat belts do save lives. (AT&T)

THE BREAKING POINT
MP, 16mm, Sound, Color, 24 Mins-
A safety loss-and-damage film which points out that the common cause of accidents produces a common result--damage to people and things.(AAR)

A GRAY DAY FOR O'GRADY
MP, 16mm, Sound, B&W, 15 Mins.
Shows the necessity and importance of all levels of supervision accepting responsibility in preventing injuries. (AAR)

GROWING PAINS
MP, 16mm, Sound, Color, 33 Mins.
Emphasizes the importance of a mature attitude toward safety among plant workers. (NCSA)

NO ONE ELSE CAN DO IT
MP, 16mm, Sound, B&W, 13 Mins.
Deals with a foreman's responsibility for the safety of his subordinates. (AAR)

ON EVERY HAND
MP, 16mm, Sound, Color, 10 Mins.
Depicts a variety of hazards to hands and tells how to avoid them. (NSC)

SAFETY AND THE FOREMAN SERIES
I. Fact Finding, Not Fault Finding
MP, 16mm, Sound, B&W, 12 Mins.
Cites foreman's responsibility for checking equipment, working conditions, etc. (NSC)

SAFETY AND THE FOREMAN SERIES
II. Foresight, Not Hindsight
MP, 16mm, Sound, B&W, 12 Mins.
How foremen can help eliminate hazards before they cause accidents. (NSC)

SAFETY AND THE FOREMAN SERIES
III. No One Else Can Do It
MP, 16mm, Sound, B&W, 12 Mins.
Foreman's responsibility for making safety work; safety as a major production tool. (NSC)

SAFETY AND THE FOREMAN SERIES
IV. What They Don't Know Can Hurt
MP, 16mm, Sound, B&W, 12 Mins.
Need to show workers right way of doing a job and to correct them when wrong. (NSC)

TO LIVE IN DARKNESS
MP, 16mm, Sound B&W, 13 Mins.
A dramatic case portrayal of three men who lost their eyesight through carelessness. (AAR)

WORK SMART, STAY SAFE
FS, 35mm, Sound, Color, 10 Mins.
How accidents are caused on the job; highlights of safe work habits. (NRA)

YOUR RICHEST GIFT
MP, 16mm, Sound, Color, 10 Mins.
Demonstrates to workers their share of the responsibility for their safety from eye injury. (AFI)

SAFETY -
FIRE

THE ANGRY FLAME
FS, 35mm, Sound, Color, 10 Mins.
Fire hazards in foodservice operations, techniques on fighting them if they break out; prevention. (NRA)

READ THE LABEL--AND LIVE
MP, 16mm, Sound, Color, 9 Mins.
Explains why warning labels should be read; how to distinguish flammable products; safe handling practices for paint thinners, cleaning compounds, insecticides. (NFPA)

YOUR CLOTHING CAN BURN
MP, 16mm, Sound, Color, 13 Mins.
Tells which fabrics are safest, which are easily ignited, causes and prevention of clothing fires. (NFPA)

SAFETY -
FIRST AID

FIRST AID NOW
MP, 16mm, Sound, Color, 28½ Mins.
Shows what to do in case of burns or broken bones; how to control internal and external bleeding; and how to administer mouth-to-mouth resuscitation when breathing has stopped. (JJ)

SAFETY -
MATERIAL HANDLING

HOW TO AVOID MUSCLE STRAIN
MP, 16mm, Color, 15 Mins.
Diagrammatic illustration of Muscle Strains and Motion Studies. (BSI)

HOW TO LIFT PROPERLY
FS, 35mm, Sound, Color, 6½ Mins.
The proper use of body mechanics to prevent injury and eliminate strain. (VLI)

LIFT WITH YOUR HEAD
FS, 35mm, Script provided.
Teaches and reminds employees how to avoid back injuries due to lifting; shows wrong and right way to lift and how to reach. (AHMA)

MANUAL LIFTING AND HANDLING
Slides, Color, Script provided.
How to lift objects without straining or injuring the back; how to prevent falls or collisions.(NSC)

A NEW WAY TO LIFT
MP, 16mm, Sound, Color, 10 Mins.
Describes new lifting technique designed to eliminate painful back injury. (NSC)

YOU CAN HANDLE IT
MP, 16mm, Sound, B&W, 10 Mins.
Demonstrates safe material handling methods, lifting, carrying, stacking, etc. (NSC)

SAFETY -
SAFETY PROGRAMS

MARGIN OF SAFETY
MP, 16mm, Sound, B&W, 22 Mins.
Explains the need for safety measured in industry; the adoption of safety rules. (MIPS)

RX--SAFETY
MP, 16mm, Sound, Color, 20 Mins.
A review of a typical hospital safety program (ANA)

SAFETY BEGINS WITH YOU
FS, 35mm, Sound, Color, 9½ Mins.
Teaches a new employee how accidents can be prevented while using equipment during routine work day. (VEI)

SAFETY IS IN ORDER
MP, 16mm, Sound, Color, 10 Mins.
Discusses the relationship of housekeeping and maintenance to safety. (NSC)

SANITATION -

GENERAL

DOUBLE BUCKET TECHNIQUES
VTR, 7 Mins.
The double bucket technique, using one mop, is demonstrated. (AIR)

MOPS
MP, 16mm, Sound, Color, 9½ Mins.
Shows the preparation, use, maintenance and storage techniques of the "Urbana" dust mop and wet mop. (VA)

THE SCHOOL BUS: SPRAY TECHNIQUE
VTR, 12 Mins.
A sanitation procedure for a school bus is demonstrated, including the use of a spray/fogger unit. (AIR)

SANITATION -

FACILITIES

COLOR IT CLEAN
MP, 16mm, Sound, Color, 20 Mins.
Follows an area janitor through the daily toilet cleaning procedures. (VA)

CONSERVE YOUR ENERGY
FS, 35mm, Sound, Color, 15 Mins.
Step-by-step procedures for cleaning washrooms. (HUN)

INTRODUCTION TO SWIMMING POOL SANITATION (M-402)
MP, 16mm, Sound, Color, 24 Mins.
An introduction to swimming pool sanitation. Lecture. (NMAC)

KEEP IT CLEAN
MP, 16mm, Sound, Color, 30 Mins.
Floor care and rest room cleaning are featured with emphasis on step-by-step procedures and the importance of the proper maintenance of these areas. (HUN)

THE LOCKER AND SHOWER ROOMS: HOSE PROPORTIONATOR TECHNIQUE
VTR, 27 Mins.
One of the fastest methods of applying a detergent-disinfectant solution in area with floor drains is to use a hose proportionator, coupled with a garden hose. (AIR

THE LOCKER AND SHOWER ROOMS: SPRAY TECHNIQUE
VTR, 33 Mins.
Shows how a locker and shower room can be totally cleaned and disinfected with the use of a pump tank spray unit. (AIR)

THE REST ROOM: DOUBLE BUCKET TECHNIQUE
VTR, 34 Mins.
Shows step-by-step procedures for establishing a total sanitary environment in your rest room; utilizes the double bucket technique and cotton-head mops. (AIR)

THE REST ROOM: HOSE PROPORTIONATOR TECHNIQUE
VTR, 22 Mins.
Shows a complete sanitation procedure for cleaning toilet bowls, urinals, commodes, sinks, mirrors, walls and floors in the rest room areas. (AIR)

THE REST ROOM: SPRAY TECHNIQUE
VTR, 37 Mins.
Use of a pump tank sprayer for product application; emphasizes the ability to reach inaccessible areas. (AIR)

SPRAY CLEANING RESTROOMS
FS, 35mm, Sound, Color, 12 Mins.
Importance of proper maintenance of floors and fixtures in restrooms. (HSCE)

THE SWIMMING POOL: HOSE PROPORTIONATOR TECHNIQUE
VTR, 11 Mins.
A fast and efficient method for keeping the swimming pool perimeter free from dirt and germs is demonstrated. (AIR)

TOILET TECHNOLOGY
MP, 16mm, Sound, Color
Procedures and methods for the care of restrooms and locker room facilities. (ACC)

SUGGESTION SYSTEMS

IMAGINATION AT WORK
MP, 16mm, Sound, Color, 21 Mins.
Illustrated how anyone can do more creative thinking; stimulates suggestion program, methods improvement and problem solving. (RFI)

IMPROVING THE JOB (OE 163)
MP, 16mm, Sound, B&W, 9 Mins.
A supervisor asks an employee for work-improvement suggestions. (GSA)

TRAINING -

GENERAL

CASH ON THE BARREL HEAD
MP, 16mm, Sound, Color, 20 Mins.
Drives home some hard facts about the value of an employee's company-provided benefits 'package." (BNA)

COLLECTIVE BARGAINING--You Are There at the Bargaining Table
MP, 16mm, Sound, B&W, 50 Mins.
Designed to show management, supervisory and plant personnel how collective bargaining actually works. (AMA)

CREATIVITY
MP, 16mm, Sound, B&W, 21 Mins.
Demonstrations exploring the effects on creativity of such common blocks as lack of curiosity and repressive effects of stereotyped training and education; suggestions on how to overcome them. (AMA)

PERFORMANCE STANDARDS--Setting Standards of Performance
MP, 16mm, Sound, B&W, 31 Mins.
Establishment of a foundation and framework for a productive meeting on setting standards of performance. (AMA)

PREVENTING WASTE
MP, 16mm, Sound, Color, 8 Mins.
Motivates all personnel to "think waste" and gives a few pointers on some of the little things that add up to significant loss. (NEM)

QUALITY MOTIVATION
Slides, Sound, Color, 16 Mins.
Methods of improving employee morale, safety, reducing waste, downtime and increasing productivity. (GPC)

YOU'RE COMING ALONG FINE.
MP, 16mm, Sound, Color, 23 Mins.
Provides many insights into the appraisal process. (RFI)

TRAINING -

INDUCTION AND ORIENTATION

A GOOD BEGINNING
MP, 16mm, Sound, Color, 10 Mins.
Demonstrates and compares the correct techniques with the wrong way to induct and train employees on new jobs. (BNA)

INSTRUCTING THE WORKER ON THE JOB (OE 155)
MP, 16mm, Sound, B&W, 14 Mins.
How not to instruct a new worker and the results of poor on-the-job instruction; in contrast, how such instruction should be done. (GSA)

TRAINING -

MANAGEMENT

AN EXTRA 5 KNOTS
I. The Communication of Purpose
MP, 16mm, Sound, B&W, 40 Mins.
Distinguishes between what people work at and what people work for. (RFI)

AN EXTRA 5 KNOTS
II. The Strength of Leaders
MP, 16mm, Sound, B&W, 40 Mins.
Explores four characteristics common to all leaders and traces the effects of each on motivation. (RFI)

AN EXTRA 5 KNOTS
III. The functions of Management
MP, 16mm, Sound, B&W, 40 Mins.
Reveals what specific questions a manager must answer if his people are to give him that "extra 5."

ARE YOU EARNING THE RIGHT TO MANAGE OTHERS?
MP, 16mm, Sound, Color, 28 Mins.
Every manager has to "earn the right" to be a strict, no-nonsense supervisor by building a "supportive" relationship with subordinates. (BNA)

BREAKING THE DELEGATION BARRIER
MP, 16mm, Sound, Color, 30 Mins.
For managers who have difficulty in giving their people sufficient responsibility and authority. (RFI)

COMMUNICATING MANAGEMENT'S POINT OF VIEW
MP, 16mm, Sound, Color, 24 Mins.
Shows how managers can become more skillful in the aspect of communicating techniques. (BNA)

DELEGATION
MP, 16mm, Sound, B&W, 21 Mins.
Examines the three main aspects of delegations Responsibility, Authority and Accountability. (AMA)

THE EFFECTIVE EXECUTIVE
I. Managing Time
MP, 16mm, Sound, Color, 25 Mins.
Demonstrates why every executive needs to know where his time goes and how to plan more effective use of it. (BNA)

THE EFFECTIVE EXECUTIVE
II. What Can I Contribute?
MP, 16mm, Sound, Color, 25 Mins.
Any organization is really a group of specialists working together as a team. (BNA)

THE EFFECTIVE EXECUTIVE
III. Focus on Tomorrow
MP, 16mm, Sound, Color, 25 Mins.
Yesterday's successes linger on beyond their productive life and become "investments in managerial ego." (BNA)

THE EFFECTIVE EXECUTIVE
IV. Effective Decisions
MP, 16mm, Sound, Color, 25 Mins.
Shows how effective executives utilize constructive dissent to make sure that each decision is the best choice of alternatives. (BNA)

THE EFFECTIVE EXECUTIVE
V. Staffing for Strength
MP, 16mm, Sound, Color, 25 Mins.
Effective executives never ask, "What can my subordinates not do?" They ask, "What can he do uncommonly well?" (BNA)

GENERAL MANAGEMENT--Managing a Manager's Time
MP, 16mm, Sound, B&W, 24 Mins.
A different view of where and how a manager spends his time. (AMA)

HOW GOOD IS A GOOD GUY?
MP, 16mm, Sound, Color, 21 Mins.
Explores why some leaders fail to get the respect of their people; how to be fair yet firm. (RFI)

LEADERSHIP--Leadership Characteristics
MP, 16mm, Sound, B&W, 23 Mins.
Examination of the type of authority a person can exercise in getting work done through people. (AMA)

THE MAKING OF A DECISION
MP, 16mm, Sound, Color, 32 Mins.
Motivates managers to follow a rational process in their decision making. (RFI)

MANAGEMENT BY OBJECTIVES
MP, 16mm, Sound, Color, 27 Mins.
Offers many important "how-to's" in applying a program using this technique. (BNA)

MANAGEMENT FILM CLASSICS
II. The Principles of Organization
MP, 16mm, Sound, B&W, 30 Mins.
Establishes and explains the ten basic principles of organization. (AMA)

MANAGEMENT FILM CLASSICS
III. How the Organization Affects the Man
MP, 16mm, Sound, B&W, 35 Mins.
The influence of the organization on the man in terms of the true elements which motivate him. (AMA)

MANAGEMENT FILM CLASSICS
IV. The Relationship Between Line and Staff
MP, 16mm, Sound, B&W, 35 Mins.
Unveils the rightful place and prerogative of line and staff in the communication chain. (AMA)

MANAGEMENT FILM CLASSICS
V. Education and Training of Future Managers
MP, 16mm, Sound, B&W, 47 Mins.
Outlines the four basic skills which should be taught in developing future managers. (AMA)

MANAGEMENT, MOTIVATION & THE NEW MINORITY WORKER
MP, 16mm, Sound, Color, 43 Mins.
Deals frankly and openly with the problems encountered by foremen and supervisors in handling hard-core employees. (RFI)

MANAGERS IN ACTION
III. Management the Simple Way
MP, 16mm, Sound, B&W, 30 Mins.
Six simple steps to good management. (AMA)

MANAGERS IN ACTION
V. Keep the Pressure Down
MP, 16mm, Sound, B&W, 30 Mins.
A frank discussion of one of the toughest problems facing a manager: how to correct employee performance. (AMA)

MANAGERS IN ACTION
X. Management Refueling
MP, 16mm, Sound, B&W, 30 Mins.
Explores the resources available to the man who would get the greatest satisfaction out of his management activity. (AMA)

MANAGERS IN ACTION
XI. How Do I Know I'm a Pro?
MP, 16mm, Sound, B&W, 30 Mins.
A discussion of several basic qualities of the thoroughly professional manager. (AMA)

MANAGERS IN ACTION
XIII. An Enlightened Manager
MP, 16mm, Sound, B&W, 30 Mins.
What is an enlightened manager? A personal answer to this provocative question. (AMA)

MANAGERS IN ACTION, SERIES II
II. Setting Your Target
MP, 16mm, Sound, B&W, 30 Mins.
Examines the principles of long-range planning and how to gain the perspective for successful planning of any kind. (AMA)

MANAGERS IN ACTION, SERIES II
III. What's the Job?
MP, 16mm, Sound, B&W, 30 Mins.
Discussion of job descriptions and an organization chart, their importance, basic functions and principles. (AMA)

MANAGERS IN ACTION, SERIES II
V. Skill Practice
MP, 16mm, Sound, B&W, 30 Mins.
The best tools for conducting a job appraisal interview. (AMA)

MANAGERS WANTED
MP, 16mm, Sound, Color, 28 Mins.
Brings into focus problems which influence the career development of every manager. (RFI)

STYLES OF LEADERSHIP
MP, 16mm, Sound, Color, 26 Mins.
Helps managers find the right balance between effective control and the meaningful involvement of their people. (RFI)

TOUGH-MINDED MANAGEMENT
I. Management by Example
MP, 16mm, Sound, Color, 25 Mins.
A tough-minded manager is not solely a disciplinarian, but one whose primary drive is to build himself, his subordinates and his organization. (BNA)

TOUGH-MINDED MANAGEMENT
II. The Man in the Mirror
MP, 16mm, Sound, Color, 25 Mins.
Discusses a manager's behavior off the job as well as on the job. (BNA)

TOUGH-MINDED MANAGEMENT
III. The Fully Functioning Individual
MP, 16mm, Sound, Color, 25 Mins.
One must grow, challenge himself, and have the courage to stick his neck out to support the organization; in return for the right to expect growth opportunities and fair appraisal. (BNA)

TOUGH-MINDED MANAGEMENT
IV. The Fully Functioning Organization
MP, 16mm, Sound, Color, 25 Mins.
There must be a "grand design" which sets the style and tone of the entire organization. (BNA)

TRAINING -

SUPERVISORY

THE CASE OF THE MISSING MAGNETS
MP, 16mm, Sound, Color, 10 Mins.
Helps supervisors to understand that "a taut ship" goes hand-in-hand with human relations in building a highly-motivated team. (BNA)

THE CHALLENGE OF LEADERSHIP
MP, 16mm, Sound, Color, 10 Mins.
Designed to help supervisors identify and analyze the qualities which made a leader. (BNA)

INSTRUCTIONS OR OBSTRUCTIONS
MP, 16mm, Sound, Color, 10 Mins.
Will give supervisors many useful hints on how to handle the difficult job of communicating verbally with subordinates. (BNA)

IT'S AN ORDER
MP, 16mm, Sound, B&W, 12 Mins.
Illustrates that unless supervisors give orders clearly the worker will not be able to carry them out efficiently and safely. (AAR)

LISTEN, PLEASE
MP, 16mm, Sound, Color, 10 Mins.
Emphasizes the importance of listening in a supervisory job. (BNA)

MAN IN THE MIDDLE
MP, 16mm, Sound, B&W, 28 Mins.
The story of the average supervisor caught in the middle between his boss, the union and his subordinates. (RFI)

OVERCOMING RESISTANCE TO CHANGE
MP, 16mm, Sound, Color, 30 Mins.
Shows supervisors how to recognize the emotional factors which breed resistance to change. (RFI)

SUPERVISING WORKERS ON THE JOB (OE 157)
MP, 16mm, Sound, B&W, 10 Mins.
Illustrates good and poor methods of supervision; the dangers of "snoopervising." (GSA)

THE WINNING COMBINATION
MP, 16mm, Sound, Color, 10 Mins.
Tackles the difficult supervisory job of motivating subordinates to cooperate with the company's efforts to reduce waste and control costs. (BNA)

WORKING WITH OTHER SUPERVISORS (OE 153)
MP, 16mm, Sound, B&W, 8 Mins.
Shows how a supervisor fails because he does not recognize the importance of working harmoniously with other people, especially his fellow supervisors. (GSA)

HOUSEKEEPING -

GENERAL

AEROSOLS--THE TIME SAVERS
MP, 16mm, Sound, Color, 5 Mins.
A capsuled view of the aerosol industry; general information. (CSMA)

AT YOUR SERVICE
MP, 16mm, Sound, Color, 13½ Mins.
Presents the history of the linen supply industry in North America; shows how the industry works in cleaning and processing linens. (LSAA)

CASE OF THE CLUTTERED CORNER
MP, 16mm, Sound, B&W, 10 Mins.
How clutter and poor housekeeping contributes to accidents. (NSC)

DOWN AT THE OFFICE
MP, 16mm, Sound, B&W, 10 Mins.
Discusses importance of good housekeeping in offices and commercial building operations. (NSC)

ENVIRONMENTAL HEALTH ASPECTS OF NURSING HOMES (MIS-6[illegible])
MP 16mm, Sound, Color, 14 Mins.
Presents general and specific factors significant in nursing home facilities: laundering, waste disposal, food sanitation. (NMAC)

HOUSEKEEPING'S PLACE ON THE TEAM
FS, 35mm, Sound, Color, 7 Mins.
Relates the need for different departments and how housekeeping fits in to complete the team. (VLI)

KEEP IT CLEAN FOR SAFETY'S SAKE
Slides, Color, Script provided.
Discusses housekeeping chores like keeping aisles clear, eliminating tripping hazards, storing tools and rags. (NSC)

LINEN HANDLING IN NURSING HOMES (MIS-864)
MP, 16mm, Sound, Color, 9 Mins.
Shows the importance of the whole cycle of linen handling to the control of cross infection in nursing homes and related facilities. (NMAC)

THE LINEN RENTAL INDUSTRY STORY
MP, 16mm, Sound, Color, 13½ Mins.
Shows the use of textile garments in industries, laboratories, "clean rooms" and explains the linen supply services. (LSAA)

SOURCE INDEX

AAR - Association of American Railroads
American Railroads Building
Washington, D. C. 20036

ACC - Advance Chemical Company
333 Fell Street
San Francisco, CA 94102

AFI - Association Films, Inc.
600 Grand Avenue
Ridgefield, NJ 07657

AHA - American Hospital Association
840 North Lake Shore Drive
Chicago, IL 60611

AHMA - American Hotel & Motel Association
888 Seventh Avenue
New York, NY 10019

AIA - American Institute of Architects
Documents Division
1735 New York Avenue, N.W.
Washington, D.C. 20006

AIR - Airkem, a division of Airwick Industries, Inc.
111 Commerce Road
Carlstadt, NJ 07072

AMA - American Management Association
The American Management Association Building
135 West 50th Street
New York, NY 10020

ANA - ANA-NLN Film Library
267 West 25th Street
New York, NY 10001

APA - American Paper Institute
260 Madison Avenue
New York, NY 10016

APE - American Petroleum Institute
1271 Avenue of the Americas
New York, NY 10020

ARMC - Adams Rite Manufacturing Company
1425 Grand Central Avenue
Glendale, CA 91201

AT&T - American Telephone & Telegraph Company
192 Broadway
New York, NY 10038
(Contact your local Bell Telephone Business Office)

BNA - BNA Films
5615 Fishers Lane
Rockville, MD 20852

BOM - Bureau of Mines
U. S. Department of Interior
4800 Forbes Avenue
Pittsburgh, PA 15213

BSI - Bray Studios, Inc.
630 Ninth Avenue
New York, NY 10036

CIF - Coronet Instructional Films
65 East South Water Street
Chicago, IL 60601

CIPRA - Cast Iron Pipe Research Association
Suite 323, Executive Plaza East
1211 West 22nd Street
Oak Brook, IL 60521

CSMA - Chemical Specialties Manufacturers Association
50 East 41st Street
New York, NY 10017

DIV - Diversey Chemical Company
212 West Monroe Street
Chicago, IL 60606

DOW - The Dow Chemical Company
Audio-Visual Center
2030 Abbott Road Center
Midland, MI 48640

EBEC - Encyclopaedia Britannica Educational Corporation
425 North Michigan Avenue
Chicago, IL 60611

FWS - U. S. Fish & Wildlife Service
Predator and Rodent Control Branch
Washington, D. C. 20025

GSA - National Audiovisual Center (GSA)
Washington, D. C. 20409

GPC - Gerber Products Company
445 State Street
Fremont, MI 49412

GWC - Geerpres Wringer Company
P. O. Box 658
Muskegon, MI 49443

HES - Health Education Service
P. O. Box 7283 - Capitol Station
Albany, NY 12224

HI - Hercules, Inc.
Wilmington, DE 19899

HSC - Henry Strauss & Company
31 West 53rd Street
New York, NY 10019

HSCE - Hillyard Sales Company - Eastern
St. Joseph, MO 64502

HUN - Huntington Laboratories, Inc.
P. O. Box 710
Huntington, IN 46750

ISM - Institute of Sanitation Management
1710 Drew Street
Clearwater, FL 33515

ISSA - International Sanitary Supply Association
5330 North Elston Avenue
Chicago, IL 60630

JJ - Johnson & Johnson
Consumer Services Department
New Brunswick, NJ 08903

KAB - Keep America Beautiful, Inc.
99 Park Avenue
New York, NY 10016

KNA - "Kex" National Association
7100 Baltimore Avenue
College Park, MD 20740

LBD - Link-Belt Division, FMC Corporation
Public Relations Department
Film Library
Prudential Plaza
Chicago, IL 60601

LSAA - Linen Supply Association of America
P. O. Box 2427
Miami Beach, FL 33140

MCP - Multi-Clean Products, Inc.
2277 Ford Parkway
St. Paul, MN 55116

MHI - Material Handling Institute
1326 Freeport Road
Pittsburgh, PA 15238

MSPSD - Minneapolis-St. Paul Sanitary District
2400 Childs Road
St. Paul, MN 55106

MTPS - Modern Talking Picture Service
1212 Avenue of the Americas
New York, NY 10036

NAPHCC - National Association of Plumbing, Heating
and Cooling Contractors
1016 20th Street, N. W.
Washington, D. C. 20036

NCA - National Canners Association
1133 20th Street, N. W.
Washington, D. C. 20036

NCSA - National Crushed Stone Association
1415 Elliot Place, N. W.
Washington, D. C. 20007

NEM - National Educational Media, Inc.
3815 West Cahuenga Boulevard
Hollywood, CA 90028

NFPA - National Fire Protection Association
60 Batterymarch Street
Boston, MA 02110

NMAC - National Medical Audiovisual Center (annex)
Station K
Atlanta, GA 30324

NOR - Norton Company
New Bond Road
Worcester, MA 01606

NRA - National Restaurant Association
Educational Materials Center
1530 North Lake Shore Drive
Chicago, IL 60610

NSC - National Safety Council
425 North Michigan Avenue
Chicago, IL 60611

NWI - National Water Institute
420 Lexington Avenue
Room 1250
New York, NY 10017

OCD - Office of Civil Defense
The Pentagon
Washington, D. C. 20310

[illegible] - Single Service Institute
250 Park Avenue
New York, NY 10017

RFI - Roundtable Films, Inc.
321 South Beverly Drive
Beverly Hills, CA 90212

RMC - Rockwell Manufacturing Company
Flexible Pipe Tool Division
415 Conga Boulevard
Dallas, TX 75208

SCJ - S. C. Johnson & Son, Inc.
Service Products Division
Racine, WI 53403

SDA - The Soap and Detergent Association
Industrial & Institutional Division
475 Park Avenue South
New York, NY 10016

SOC - Shell Oil Company
Film Library
450 North Meridian Street
Indianapolis, IN 46204

SMI - Sterling Movies, Inc.
43 West 61st Street
New York, NY 10023

TC - Trainex Corporation
P. O. Box 116
Garden Grove, CA 92642

TGFC - Tennessee Game and Fish Commission
Film Library
1600 Lock Road
Nashville, TN 37202

3M - 3M Company
3M Center
St. Paul, MN 55101

UEVA - Universal Education and Visual Arts
221 Park Avenue, South
New York, NY 10003

USDA - Motion Picture Service
Office of Infromation
U. S. Department of Agriculture
Washington, D. C. 20250

USSPWC - U. S. Senate Public Works Committee
Room 4204
New Senate Office Building
Washington, D. C. 20510

VA - Visual Aids
University of Illinois
Champaign, IL 61820

VLI - Vestal Laboratories, Inc.
Division of W. R. Grace & Company
4963 Manchester Avenue
St. Louis, MO 63110

WGL - Walter G. Legge Company, Inc.
101 Park Avenue
New York, NY 10017

WKPC - Wil-Kil Pest Control, Inc.
522 West North Avenue
Milwaukee, WI 53212

APPENDIX 4-B
pp. 191-199

______________________________ COLLEGE/UNIVERSITY

Department of the Physical Plant Date ____________________

SPECIFICATIONS
FOR CONTRACT JANITORIAL SERVICES

SECTION 1. INFORMATION FOR BIDDERS:

1-01 The Janitorial Services Contractor shall furnish all labor and equipment necessary to perform the janitorial services, including cleaning, dusting, wicking, mopping, stripping waxing, polishing, washing, removal of trash and waste materials, refilling of dispensers, plus "As Required" services described herein such as minimal access snow removal in the buildings listed, and to be included in any buildings which might be added in an extension of this contract.

1-02 A general campus map is attached showing the location of each of the above buildings. The contractor must physically inspect each building before submitting his bid. Space diagrams of each building are attached as part of these specifications. These show the area to be cleaned in each building and approximate net area of each room. Floor areas may be verified if desired.

1-03

BUILDINGS TO BE CLEANED	GROSS SQ FT	NET SQ FT TO BE CLEANED

1-04 Bids are requested in two ways, (1) a monthly Lump Sum charge for each of these buildings, (2) a bid based upon a "Time and Material" basis. The University reserves the right to award the contract for any one or any combination of buildings, whichever is in the best interest of the University, on either the "Lump Sum" or "Time and Material" basis.

1-05 The Standard General Conditions of Contract attached hereto shall apply to this work.

1-06 Contractors are required to submit a bid bond for the sum of items in the lumps sum prices based on the total lump sum contractual cost for a six-month period; or in lieu thereof a certified check in the amount of 5% of the total lump sum bid. Bond or check are forfeitable if bidder is awarded the contract and fails to perform.

(sheet 1 of 9)

1-07 The Contractor should clarify any questions he may have prior to his submission of a bid by contacting the Buildings Services Superintendent, located in the ______________________ Building, phone number ___________. The submission of a bid shall indicate that the Contractor thoroughly understands the scope of the work and the services to be performed.

1-08 While this initial contract is to be awarded for a six (6) month period, it can be extended for an additional six (6) month period, after periodic reviews and mutually agreed upon amendments up to a total of at least three (3) years.

1-09 It shall be the Contractor's responsibility for compliance with all local, county, state and federal laws.

SECTION II. GENERAL CONDITIONS:

2-01 The right is reserved by the University to reject any or all proposals, and to waive any formal requirements as the interest of the University may require. No Bidder may withdraw his bid within thirty (30) days after the formal opening thereof. Acceptance of any proposal will be subject to approval of submittal data and engineering equipment.

2-02 Bidders must allow sufficient time for all bids, either mailed or hand-carried to reach this office by the date and time indicated for the bid opening. Late bids, including those postmarked prior to the bid opening date, will not be considered.

2-03 Forms for Bid Proposals are included in this specification. Bids are requested in triplicate. If you are not in a position to bid on the work at this time, please so state in writing on the Bid Proposal Form in order that the University may retain your name on its listing of preferred bidders for future work.

2-04 Contractors and Subcontractors should include the applicable Sales and Use Tax on all purchases. Contractors will be required to pay the tax on all purchases and can recover it only as a part of his price.

2-05 This contract is to be in force for a period of six months commencing _____________ and terminating on _____________.

2-06 The University and the Contractor shall each have the right to terminate the Contract upon thirty days written notice to the other party.

2-07 In view of the policy of the University with respect to endorsement of products,materials or equipment of any manufacturer; the Contractor shall not permit endorsements by photographs or written statements involving the University without prior written approval of the University through the Building Services Division.

2-08 All work under this contract shall be inspected by the Superintendent of Building Services Division, or his representative, to insure strict compliance with the specifications.

2-09 Because of the acute shortage of parking space, the Contractor's personnel will be required to park in those parking areas where assigned. Failure of Contractor's employees to park their personal automobiles where assigned may result in a parking violation citation, with accompanying monetary penalties or in violations of safety regulations the vehicles may be towed away and held until towing charge is paid.

2-10 Since the University cannot be responsible for losses of Contractor's supplies, tools, or equipment, Contractors are hereby notified of their responsibility for providing proper identification and security for such items at their own expense.

2-11 The Contractor will be responsible for all damages to University property caused by his employees. Such damage shall be repaired promptly by the Contractor to the satisfaction of the University, at no expense to the University.

2-12 The Contractor shall be responsible for payment of all of his payrolls including withholding taxes, social security, unemployment compensation insurance, and for payment of his public liability insurance and employee bonds. Particular attention is called to records required if the contract is awarded on the "Time and Material" basis.

2-13 Payment for services shall be made to the Contractor once a month upon submission of an invoice consisting of an original and two copies, properly certified.

2-14 The University reserves the right to increase or decrease the cleaning of certain areas as circumstances may require. In the event of increased or decreased cleaning requirements, the Contractor shall submit in writing to the Department of the Physical Plant the change in man-hours of time and the additional cost or credit to the University. The cost or credit will be expected to be reasonably proportionate to the initial bid price compared with square footage of cleaning area. When the proposal is accepted by the University, it shall be confirmed in writing.

2-15 The Contractor shall provide all necessary machines, equipment, tools and labor, etc., as may be necessary to perform the work outlined herein. The University, Building Services Division, Department of the Physical Plant, shall approve all cleaning material or supplies, such as roll paper towels, toilet tissue, cleaners, liquid wax, liquid floor soap, seals, detergents, disinfectants, and liquid or bar hand soap for the use by the Contractor. The Contractor shall deposit trash in the refuse containers adjacent to the building.

(Sheet 3 of 9)

SECTION III. PERSONNEL REQUIREMENTS AND WORK PROCEDURES:

3-01 The Contractor shall present on the job at all times during the working hours, a competent Superintendent and any necessary assistants. Prior to the commencement of work, the Contractor shall submit in writing to the Department of the Physical Plant, for prior approval the name of the person intended to be employed as Superintendent for the execution of this contract along with his qualifications and past experience. The Superintendent shall be required to report to the Building Services Division, Department of the Physical Plant, as necessary to review cleaning requirements and deficiencies with the University Superintendent of Buildings Services.

3-02 The University reserves the right to execute a background investigation on any employee of this Contractor and to require the Contractor to remove any employee from the campus whose actions are considered detrimental to the best interest of the University. The Contractor shall at all times enforce strict discipline and good order among his employees and shall not employ or permit to remain on the work, any person he considers unfit. He shall enforce all regulations relative to the use of water, heat, power, smoking, and the control and use of fires as required by law. Employees shall not be allowed to loiter on the premises either before or after their working hours.

3-03 Due to the existence of valuable equipment and property, strict supervision shall be maintained to prevent petty larcenies and thefts. The University shall reserve the right to search the Contractor's employees prior to their leaving the premises, without any prior notice of such action.

3-04 Contractor's employees may use janitor's closets in each building where they may change clothing and wash up. The Contractor shall insure orderliness and cleanliness of such areas at all times.

3-05 The successful Contractor shall properly identify each employee engaged for this work. Also, the Contractor shall provide each employee with an identification card, approved in form by the Building Services Division, for entrance and exit from the building. Additionally, the employee shall be required to punch a time clock each working night upon arrival and departure. Contractor shall submit weekly tabulations of all employees who have worked with accrued time, which form must be signed by Contractor's Superintendent and the Building Services Supervisor assigned

3-06 The University will periodically inspect all work performed by the Contractor. Normally, at least a weekly joint inspection shall be conducted by Contractor or his representative and a representative of the Building Services Division.

3-07 Keys for buildings are controlled by the University Night Supervisor, Buildings Services Division, or his assigned assistant at all times. The Night Supervisor or his assistant will unlock all doors, and relock all doors after cleaning has been accomplished and see that the Building has been secured after quitting time and keys returned to the Building Services Division Office. Every effort shall be exercised by Contractor's employees to conserve electricity by only lighting areas in which work is currently being performed.

3-08 Contractor's employees shall report on forms furnished by the University to the Superintendent, Building Services, any conditions of leaky faucets, stopped toilets and drains, broken fixtures, etc., and any unusual happenings in the building.

3-09 Contractor's employees shall close and lock windows and turn off all lights. When night cleaning is finished, except as may be designated to remain lighted for security lighting.

3-10 Contractor's employees shall not disturb papers on desks, open drawers or cabinets, use telephones, televisions, radios, or drink or gamble while on duty on the campus. Violations will be grounds for dismissal.

3-11 Contractor shall not hire any personnel employed by the University regardless of their classification since work beyond forty (40) hours weekly at the same place of employment entitles workers to OVERTIME RATES.

3-12 For purposes of coordination and control the Contractor must so arrange his employees' HOLIDAYS, SICK LEAVE, AND VACATIONS to conform to University schedules. These specifications are not intended to dictate to the Contractor what his leave policies will be. However, the Contractor must make proper allowances for the employees' fringe benefits in this building. The University will not pay for any time away from the job.

3-13 Complete cleaning services will be required daily in all buildings, fifty-two (52) weeks per year.

SECTION IV. WORKMANSHIP AND HOURS:

4-01 All work shall be performed Monday through Friday, inclusive. between the hours of midnight and 4:00 a.m. except as described in paragraph 4-02. Also, the Contractor shall schedule and arrange his work so he will not interfere with operational functions of the building. At indeterminate times, some areas of the building will be occupied and used by employees for after-hours work, and such circumstances shall not alleviate responsibility of required cleaning at a later time.

4-02 Special Personnel Requirements: Contractor shall be required to provide the following personnel as indicated in specified buildings.

LIST HERE ANY SPECIAL COVERAGE BY BUILDING
AND TIME

(sheet 6 of 9)

SECTION V. WORK STANDARDS:

Definition of various operations -

CLEANING: To free from dirt or impurities, removing stains, either by hand or with tools such as urinals, water closets, sinks, drinking fountains, light fixtures, mirrors, etc.

BUFFING: To clean or shine with a floor machine, surfaces such as resilient tiles, terrazzo, wood, slate, etc.

DUSTING: To remove surface dust or dirt as from furniture, files, sills, blinds, telephones, vents, grills, lighting fixtures, with properly treated cloths.

EMPTYING: To remove accumulation of trash or residue from waste containers, ash trays, receptacles, etc., and deposit in designated containers on outside of buildings.

MOPPING: DAMP AND WET. To wash, wipe and remove from floor and stair surfaces to leave acceptably clean.

POLISHING: To smooth and brighten as by rubbing with polishing cloth using proper pastes, etc., as surfaces may require, such as brass, furniture, counters, mirrors, etc.

REFILL: To replace the contents of a container such as soap, toilet tissue, towel dispensers, etc.

STRIPPING: This is a colloquial term for removing built-up waxes, seals and other floor dressings, the original natural surface before applying a fresh coat of protective cover to surfaces such as resilient tile, wood, terrazzo, etc.

SWEEPING: To remove or clear away dirt or debris with a broom or brush. Normally all horizontal surfaces subject to foot or wheeled usage.

VACUUM: To clean with a vacuum cleaner. Regular emptying of collector device is important and proper setting of height above surface will improve effectiveness.

WASHING: The act or process of making thoroughly clean by moistening, wetting, scrubbing, rinsing, with water plus proper quantities of soap, detergents and disinfectants as furnished for various objects and equipment.

WAXING: To cover or treat with liquid wax or other floor finish in proper quantities over properly prepared surfaces to protect and beautify.

WICKING: This is a trade term to describe the process of sweeping, dusting and cleaning floor surfaces with a treated yarn mop.

5-02 Frequency of Operations - The Contractor shall be required to schedule his work to insure that the following frequency of operations are adhered to or exceeded in order to insure the University of the cleaning standard it desires.

(sheet 7 of 9)

5-03 DAILY:
1. Clean ash trays
2. Clean elevator tracks and interiors.
3. Clean mirrors and glass surfaces.
4. Clean toilets, urinals, sinks, fixtures, partitions, paper holders.
5. Clean coatracks, etc.
6. Clean erasers-chalk board type.

Dust: Bookcases; Desks; Filing cabinets; also pianos if present; Lamps; Floors; Tables; Telephones; Window sills; Radiators; Convertors and unit; Ventilator cabinets; Refrigerators and Vending machines.

Empty: Pencil sharpeners; Waste baskets.

Refill: Soap dispensers; Toilet tissue holders; Paper towel dispensers.

Sweep: Stairs; Floors

Vacuum: Carpeting and rugs (particularly walk-off rugs in entrances).

Wash: Chalkboards and chalk trays; Drinking fountains and sanitize; Hand rails.

Damp Mop: Lobbies; Hallways; Restrooms; Laboratories, if necessary.

Buff: Lobbies; Hallways.

5-04 WEEKLY:
1. Damp mop floors.
2. Dust shelving, including books, library stacks.
3. Damp mop stairs.
4. Dust lockers.
5. Sweep exterior entrances to adjoining sidewalk.

5-05 MONTHLY:
1. Clean air vents and interior doors.
2. Dust tab arm chairs and venetian blinds.
3. Wax and buff floors (resilient).
4. Vacuum upholstered furniture and drapes.

5-06 QUARTERLY:
1. Scrub uncarpeted floors.
2. Wax resilient floors.

5-07 SEMIANNUALLY:
1. Strip and wax resilient tile floors.
2. Wash exterior doors.

5-08 ANNUALLY:
1. Clean lighting fixtures.
2. Shampoo carpeting.
3. Wash venetian blinds and wash windows interior and exterior.

(sheet 8 of 9)

5-09 AS REQUIRED: Snow removal off porticos and steps down to juncture with grade or sidewalks. Sprinkle sand when necessary. This type of special service is required at the expense of interior cleaning to insure safe access by students to class and to avoid hard packing and freezing on steps. This is a judgment decision which must be made depending on type and severity of snow. Optimum is clearing of entire steps in light snowfall to a 5' wide access path in heavy snowfall.

5

UTILITIES DISTRIBUTION SYSTEMS

INTRODUCTION.. 201-203

GENERAL RECOMMENDATIONS.............................. 204-216

Figure 5-1: A Sample Utility Record, Coal Consumption Linear Graph
Figure 5-2: A Sample Utility Record, Coal Consumption Bar Graph
Figure 5-3: A Sample Utility Record, Electrical Consumption Linear Graph
Figure 5-4: Meter Record Sheet for Steam or Electric Consumption
Figure 5-5: Composite Schematic Utilities Layout
Figure 5-6: Detail Utility Location Diagram

WATER.. 216-219

HEAT... 219-222

CHILLED WATER FOR AIR CONDITIONING.................... 223

SANITARY SEWERS...................................... 223-224

STORM DRAINS... 225-226

ELECTRICITY.. 226-230

5

UTILITIES DISTRIBUTION SYSTEMS

HEAT, WATER, POWER, AND SEWERAGE. These are the primary utility services all schools need in order to operate. Because of the expense and expertise required, only large universities can afford on-campus plants for generating electricity, purifying water and treating sewage. Most small colleges generate only heat and purchase the remainder of these services from public or private utilities companies. Nearly all, however, must operate systems for distributing these services across the campus, a fact that means important responsibilities for the physical plant department: It must inspect, service and repair the sewers and all pipes, poles, valves, and switches that channel heat, power and water to working, living and learning areas across the campus.

This chapter concentrates, therefore, on the distribution systems for these major utilities with only brief reference to related services and additional problems faced by physical plant departments that also produce heat and, less frequently, water. A complete list of the utilities and educational institution might require would include:

1. Chilled water for air conditioning
2. Electricity
3. Fuel gas
4. Heat supplied by steam, water piping or electric wiring
5. Sanitary sewage
6. Storm drainage
7. Telephones
8. Water for domestic use, fire protection and irrigation

GENERAL RECOMMENDATIONS

GENERATING PLANTS

As mentioned earlier, most small schools find it more economical to purchase raw energy from local companies. A college in an isolated area not served by utility companies must of necessity build and operate a complete utility system that includes water, power, heat, and sewage plants. A rapidly growing college may be forced by economics to do the same at some point in its development. Such a decision will depend heavily on factors such as local availability of service, price structure, and capabilities of the physical plant staff.

CONSTRUCTION PLANNING

When constructing central utility plants or expanding utilities lines, important points for plant administrators to remember are:

1. Extensive changes in a utility system require careful study, including an economic analysis of the options and an expert technical appraisal of the various designs by outside consultants.

2. New construction, particularly of utilities, always involves a long lead time between initial plans and final completion.

3. All utility needs should be projected at least 10 years ahead.

4. Utility plans, therefore, should be carefully integrated into the campus comprehensive development plan.

These recommendations apply both to generating plants and to the distribution systems they feed. A major department following these guidelines can avoid unnecessary expenses like: building a heating plant that is insufficient by the time it begins operations, relocating underground lines in order to free a new construction site, or replacing underground lines with larger sizes to handle additional expansion.

CONTRACT MAINTENANCE

A problem common to small colleges in both isolated and urban areas is a restricted physical plant staff. When a physical plant department lacks personnel trained in maintenance of utilities systems, it may be necessary to contract these services with the local utilities companies. Contract maintenance means either that the company completely manages the utilities or that it provides only periodic assistance on problems too specialized for the in-house staff to handle. With the first option the company performs a designated number of inspections and maintenance operations throughout the year. The second option may call only for annual inspection and emergency assistance on complicated tasks such as servicing or altering high voltage electric lines.

The aim of the physical plant department, however, should be eventually to manage utilities completely in-house. Because utilities are essential to the functioning of the school plant, it is preferable to have a capable staff on campus at all times. Certain tasks always require attention--testing transformers, packing leaky valves, and cleaning collected sediment in sanitary sewer manholes. School personnel are more highly motivated in their work than company employees, and they eventually should become more knowledgeable about the peculiarities and problems of the school's system. Unfortunately, a physical plant department that has to farm out such an important job may appear to default on one of its basic responsibilities.

IN-HOUSE MANAGEMENT OPTIONS

At small colleges, it is often a combined buildings and utilities division that takes charge of managing the utilities. The rationale for this is simple: Tradesmen such as electricians, plumbers and steamfitters usually are capable of working on many facets of the utilities systems. For certain kinds of equipment, however, the department should provide additional training to qualify some men as stationary engineers or to prepare them to handle more complicated aspects of utilities maintenance. A buildings electrician, for instance, normally would not be capable of splicing high voltage electric cable.

As the institution expands, it may become more efficient to assign utilities to a separate physical plant division, but only when enough men are available to completely staff the new section. If a separate utilities division is established, the physical plant director can assign responsibilities in accordance with the construction guidelines of the American Institute of Architects. These guidelines recommend drawing a line five or ten feet away from the perimeter of each building in order to designate all services inside the line as part of the building and all those outside it as part of the distribution systems. Such a demarcation leaves the buildings division with care of all interior equipment, and gives the utilities division all exterior lines as well as central utility plants.

COST AND CONSUMPTION RECORDS

Utilities administrators find careful consumption and cost records their most important management tool. Good consumption records identify average, peak and minimum demands, timing and duration of the peaks, and month-to-month use rates. Complementing them are cost records that show and graph rate schedules, total expenses, and unit costs for each type of utility provided or purchased. A good record keeping operation is worth special effort: The data it accumulates vitally benefits utilities management.

Increased economy is another benefit of good records. When records have been kept for several years and utilities are metered on a regular schedule, administrators can quickly detect unusually large and sudden uses by comparing monthly totals to past averages for each period. Heavy energy flow may stem from new uses of a building or from leaks and defects in the distribution system. Without historical records, administrators are apt to overlook these problems.

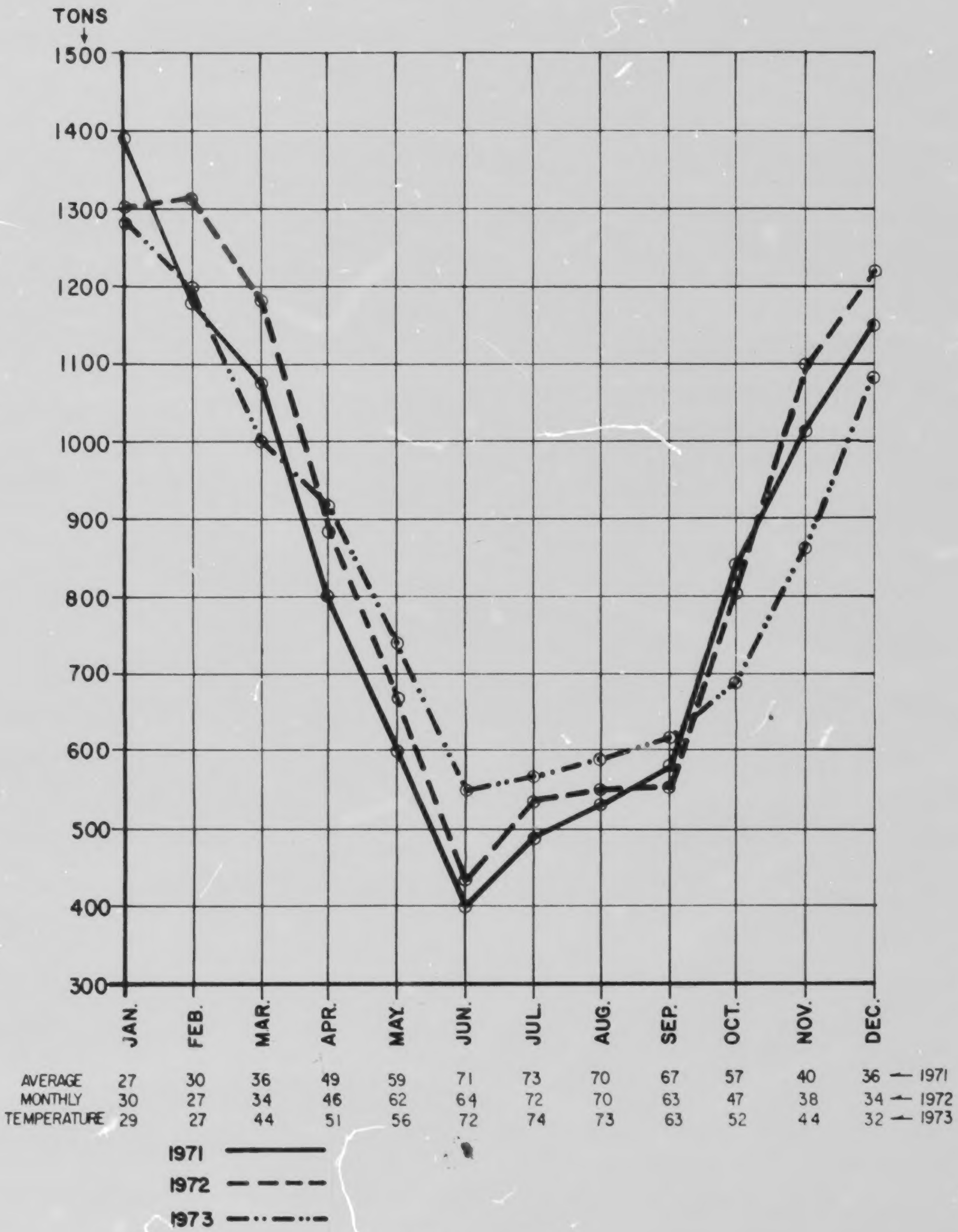
Important to both efficiency and economy are accurate budget projections, especially when they estimate the cost of servicing new building areas. Essential to these projections of future needs is the backlog of consumption trends and costs.

In order to determine consumption, administrators must assign someone to read the meters. Instead of rotating this job, it is more effective to designate the same people to handle it regularly. Train them thoroughly in the different types of meters, schedule their work to allow the same time lapse between readings, and instruct them on how to keep orderly logbooks with separate pages for each meter. Since these readers, in effect, make periodic inspection tours, they can also be charged with reporting malfunctioning meters and many other general repair problems they observe on their rounds.

For all cost and consumption records, special forms are required that specify the exact information required. Each physical plant director will want to design forms most appropriate to the information needs of his institution. Devising the best format for each type, however, is seldom a one-time effort. To facilitate a trial-and-error search, it is preferable to mimeograph the early versions for general use instead of printing them. After testing the form in actual use, the director can then revise it easily for the final, more expensive printing. Samples of various forms for utility records are shown in Figures 5-1, 5-2, 5-3, and 5-4.

A word of caution about possible excesses: A division or department head should periodically review the whole record keeping operation to insure that the department is only compiling data it can actually use. Practical use will vary from campus to campus. Some schools, for instance, will want to monitor costs for lighting every building; others may only need the monthly total for the entire campus. Paperwork for its own sake is the obsession of the weak administrator. If the data is not used in one of the ways mentioned above, there is probably no justification for compiling it.

COAL CONSUMPTION BY LINEAR GRAPH.



	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	
AVERAGE	27	30	36	49	59	71	73	70	67	57	40	36	1971
MONTHLY	30	27	34	46	62	64	72	70	63	47	38	34	1972
TEMPERATURE	29	27	44	51	56	72	74	73	63	52	44	32	1973

FIGURE 5-1.

COAL CONSUMPTION BY BAR GRAPH.

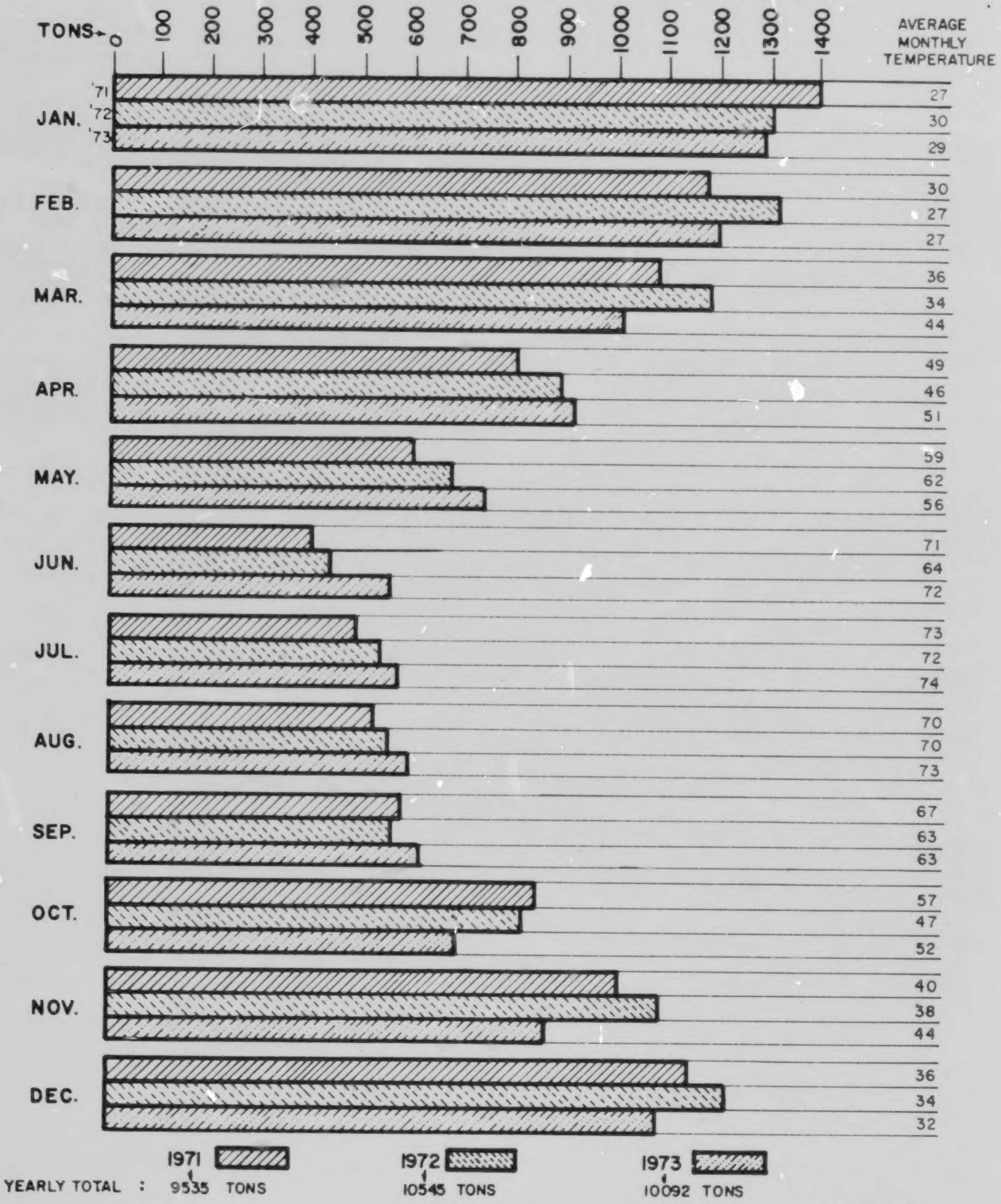


FIGURE 5-2.

ELECTRICAL CONSUMPTION BY KWH--LINEAR GRAPH

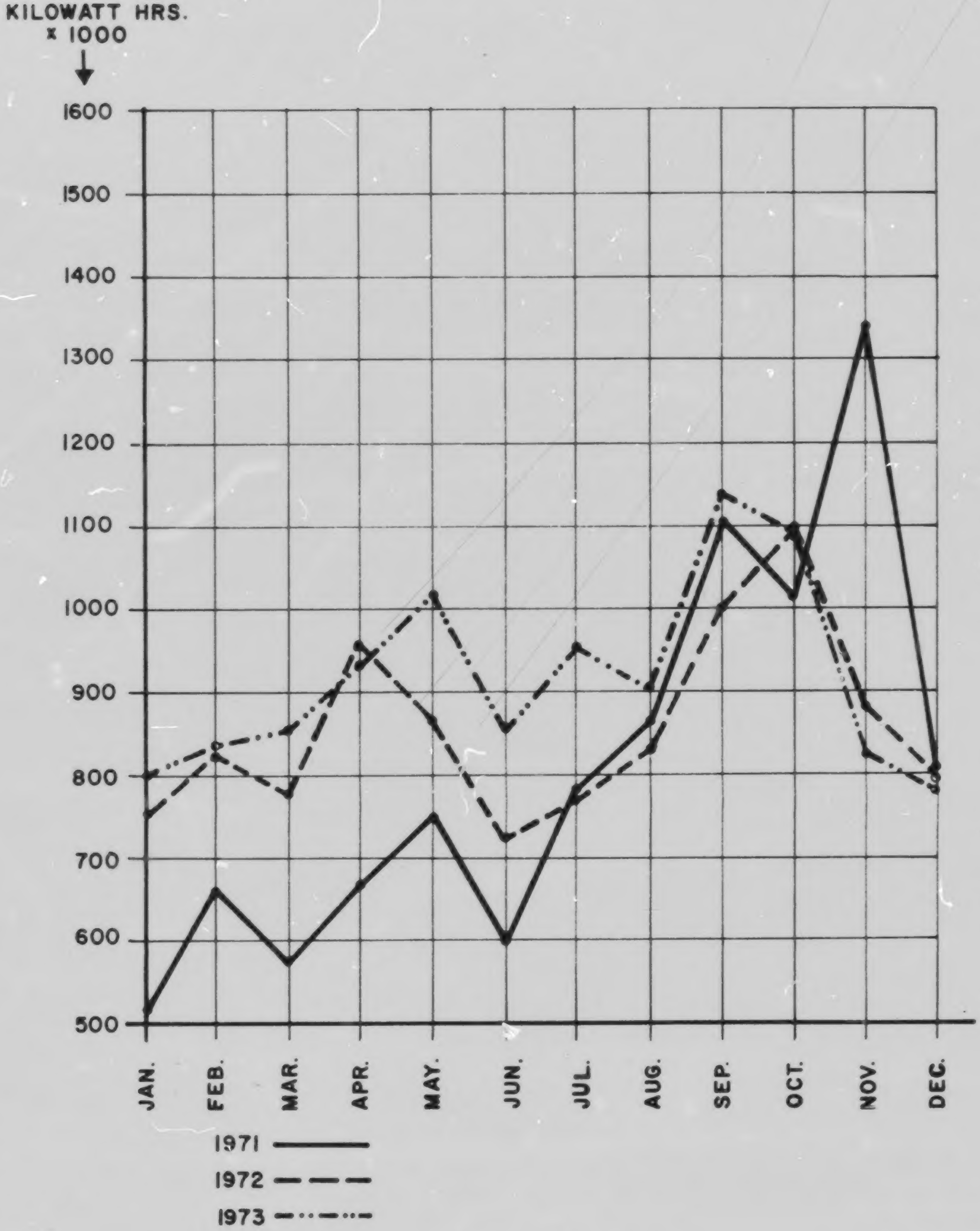


FIGURE 5-3.

UNIVERSITY/COLLEGE

METER RECORD SHEET

Year

Meter No. ....

" Type & Make .... Bldg. ....

" Capacity .... For (Service) ....

" Constant .... Deductions

Location .... Additions ....

ESTIMATING DATA

Steam lbs. per Degree Day .... *Electric* Kwh per dark hour

Extra Allowance per Mo. .... Kwh Allowance per Mo.

Volume of Bldg. (cu. ft.) .... Sq. ft. floor Lighted

Sq. Ft. of Radiation installed .... Con. Load—Light

B. T. U. Loss per Hour .... Con. Load—Power Hrs./day

No. H. W. Outlets ....

MONTH	DAY READ	READING	DIFFERENCE	CORRECTIONS (EXPLAIN ON BACK)	CONSUMPTION	ESTIMATE
OCT.						
NOV.						
DEC.						
JAN.						
MAR.						
APR.						
MAY						
SUB TOTAL						
JUNE						
JULY						
AUG.						
SEPT.						
OCT.						
TOTAL						

Figure 5-4.

TECHNICAL RECORDS

Though the point seems obvious, it is still worth stressing that the physical plant department must have an effective map system for each utility, primarily because most of them require underground lines and connections. In essence, a map system consists of two elements:

1. An index map. Basically a general schematic accurately plotted for manholes, inlets, valves and hydrants in order to show the entire utility layout with index numbers on each portion correlated to the construction drawings.

2. Construction drawings. "As-built" plans that show the size and number of pipes, cables and conduits; profiles of mains and intersections; invert elevations for conduits, inlet pipes, and outlet pipes.

Figure 5-5 is an example of a schematic utilities layout for a portion of a campus and Figure 5-6 is an example of a detailed reference sheet showing details of all conditions referenced by specific locations to the schematic plan. The department should have master copies of these drawings on an easily reproducible medium such as linen, tracing paper, sepia or mylar. These masters should never leave the file room, but those who need them--engineering consultants and repair men--should be allowed to make copies when needed.

These maps and drawings are important for designing additions to the utilities system, performing routine maintenance and repairing leaks, breaks and outages. Accurate, easily retrievable documents reduce exploration by trenching and eliminate the breaks that often result during utilities repairs and modifications.

It might be helpful to develop a numbering key for manholes (and inlets on storm drainage) in each utility system. Such a numbering system for fire hydrants has proved extremely helpful for both maintenance personnel and local fire departments. For a fire hydrant numbering system, stencil the numbers on the hydrants and furnish the fire department with copies of the key map. The index maps described above should be completed as a permanent record on linen or plastic so they will reproduce easily for use by maintenance men, engineering consultants, and others interested in the various systems. All changes require map revisions, and all revisions should be dated.

BEST COPY AVAILABLE

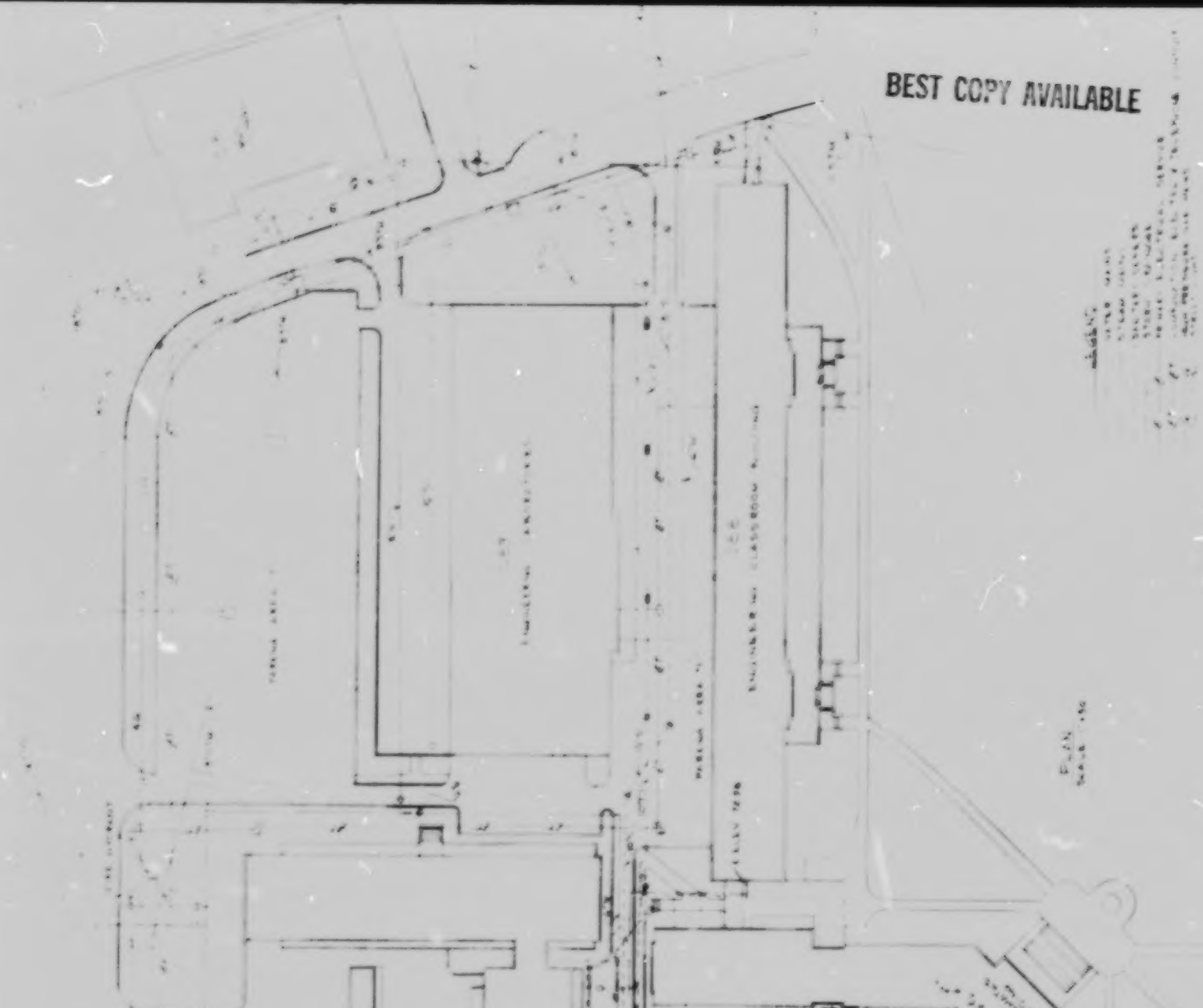

STADIUM DRIVE
CHEMISTRY BUILDING
ENGINEERING CLASSROOM BUILDING

Figure 5-5. Schematic Utilities Layout

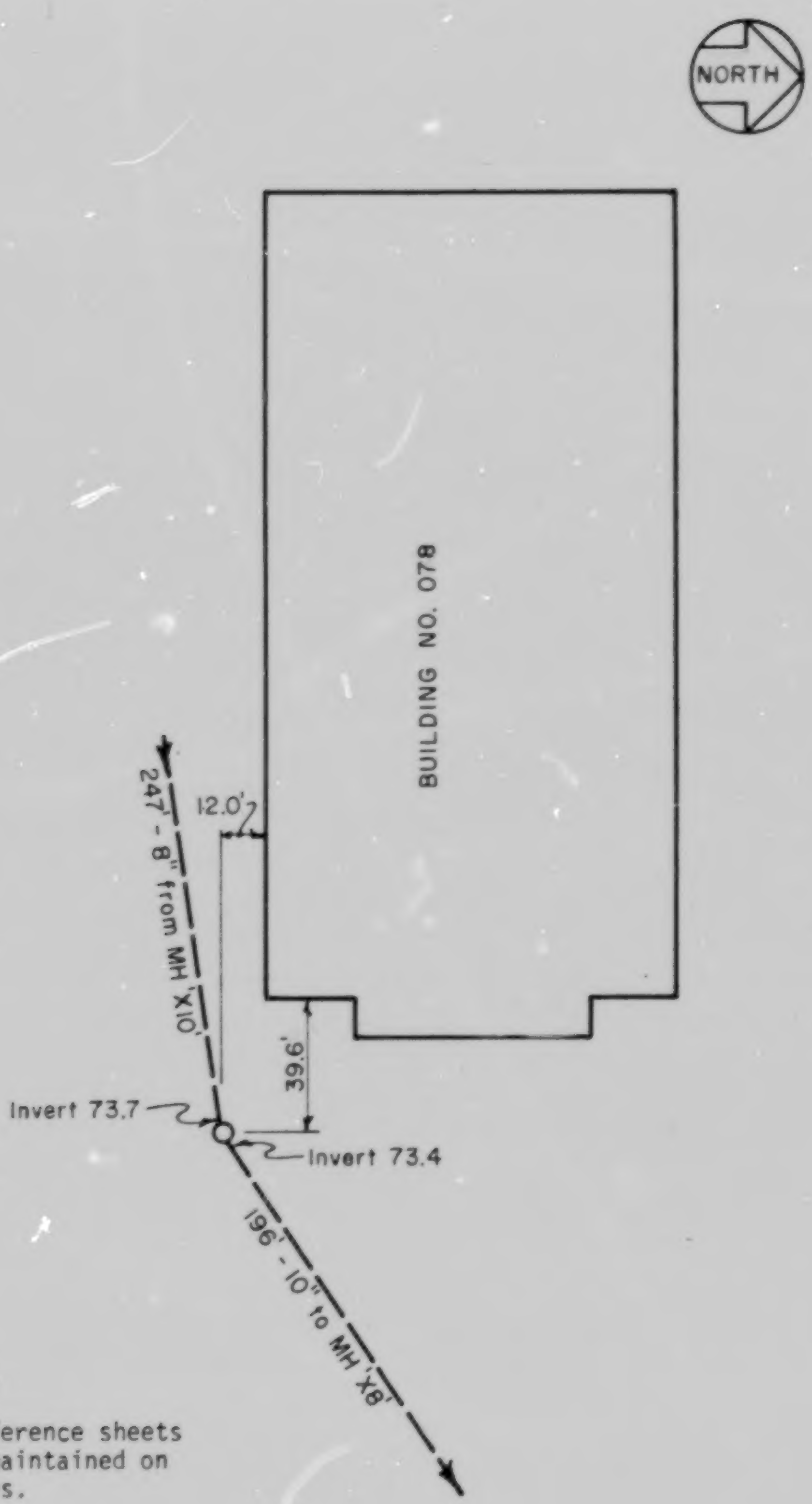

NORTH
BUILDING NO. 078
12.0'
247' - 8" from MH 'X10'
39.6'
Invert 73.7
Invert 73.4
196' - 10" to MH 'X8'

Figure 5-6.

Similar reference sheets should be maintained on all manholes.

LOCATION DIAGRAM
SANITARY SEWER MANHOLE 'X9'

PIPE TUNNELS

General recommendations about utilities must include some discussion of pipe tunnels. Of the three types of underground lines--direct burial pipes, conduits, and pipe tunnels--the last is by far the best alternative, but the least used. One tunnel can accommodate all the pipes and conduits for heat supply and return, domestic water, gas, electricity, telephones, and other systems--in short, all the basic utilities services except for storm drains and sanitary sewers. Generally, all these utilities are strung along the walls of a large tunnel that loops through the main sections of the campus, with small branch tunnels or conduits feeding individual buildings.

The great advantage is accessibility: Maintenance personnel can simply walk up to any problem point and service it with plenty of room and light to work by. Additional uses include trash removal, and emergency movement of people about the campus during a blizzard or hurricane. At some schools tunnels also provide convenient access for handicapped students using wheel chairs and crutches. The great disadvantage is cost: Pipe tunnels require a large initial expenditure, which rules them out for many small schools. Because these tunnels simplify continuing maintenance and reduce its cost, however, they should be studied carefully whenever a new school is planned or an existing one is considering rapid expansion or replacement of its old utilities system.

The two main types of pipe tunnel are concrete and prefabricated metal. Before installing either, the physical plant director should have his design engineer or an outside consultant study factors as initial cost, maintenance costs, and projected life expectancy for both types.

Both kinds of tunnel are buried the same way a simple pipe is. After an open trench is dug, a concrete tunnel is constructed there or a prefabricated tunnel is placed therein. The trench is then backfilled to cover it. These rectangular tunnels come in various widths and sizes, depending on the dimensions of the utilities they accommodate. A well-designed shaft provides adequate lighting and ventilation, enough headroom to permit men to stand erect and work easily, numerous exits to allow quick escape, and expansion room for easy installation of additional piping.

The concrete version entails greater initial cost because it requires that waterproofed, reinforced concrete sides be constructed in the open trench. Concrete tunnels last longer, however. Metal tunnels, on the other hand are cheaper because they can be prefabricated in a factory. Manufacturers build them with all piping installed at the plant, transport them to the site in sectional lengths, place them in the trench and then weld all the tunnel and interior pipe connections.

LOOPING

For underground lines distributing water, heat and electricity, two layout designs prevail. The simplest, least expensive and least efficient is the main single line feeder with branch lines to individual buildings. In a single-line set-up, a break cuts off service to all the buildings beyond that point. Nothing can flow past the breakpoint unit until it has been repaired. The preferable method, therefore, is the loop or grid pattern in which the main trunk circles back and reconnects in one or more spots with the trunk line leading from the supply source. With this circular layout personnel can reroute water, steam or power around the break by proper switching and valving, and thereby backfeed the remainder of the system.

WATER

Given a choice, a college should purchase its water from a local company or municipal system. Poor quality water brings disease, corrosion and complaints unless properly treated, and treatment requires installation and maintenance of a filtration plant. By purchasing the water, a school can avoid problems a utilities company can manage better.

PRIVATE SUPPLY

Isolated schools located far from public utilities, however, have no choice; they must collect, treat and pump their own water. For collection, they have two options: (1) drilling a deep well to an underground stratum, or (2) drawing water from an impounded stream or lake.

Drilled water is the most efficient for large quantities. It taps deep and extensive aquifiers with outcrops many miles away, and yields a constant supply unhampered by sudden fluctuations in the water table level. Deep water is usually of such good quality that it needs only minimum treatment. These advantages can offset the large initial expense for deep drilling.

Drawing water from a pond, lake or river requires a pumping station with a pipe extending out into the water. This pipe can be laid along the bottom or, if greater protection is needed, buried in a backfilled trench much like pipe installed on dry land. To keep fish and debris out of the system, protect the intake end with screening or grating.

TREATMENT

Most schools that draw their own water also have to treat it. Because a water purification plant is essential to health, a knowledgeable consultant should participate in any construction or expansion planning. Once the plant is operational, an intensive continuing maintenance program should begin with daily sampling and testing to insure the product meets health standards. Both the consultant and local health officials can assist in setting up an adequate testing procedure. A service contract could also be used for maintenance of the treatment plant.

Water treatment aims at removing silt, dirt, and bacteria, and consists of two steps--sedimentation and filtration. The first requires a large basin or reservoir to hold the water pumped from a river or lake. There the water simply lays at rest for a period while much of the suspended dirt and silt slowly settles out. If it is necessary to speed the process, certain chemicals can be added.

Filtration follows sedimentation. To clean large quantities, pass the water through a bed of specially graded sand or through a mechanical filter. Both strain out very small particles that did not settle out during sedimentation. If performed carefully and properly, filtration produces water free of contaminants. To insure final purity, chlorine is added after filtration to remove any bacteria which may have passed through the filter or which may reside in the distribution piping.

STORAGE

Since filtration rates are fairly constant and usage rates are not, the purified water must be stored during periods of light usage to prepare for peak demands. Over the decades the traditional metal overhead tank has proved the most satisfactory storage. During hours of slack use, water is pumped into it; then during heavy use periods it runs by gravity flow to wherever it is needed.

PUMPS

A water system, even one that connects to a public water supply, will require numerous pumps. Since pumps come in many sizes and designs, the physical plant administrator would do well to get professional engineering help in selecting the ones appropriate to his needs and in setting up a maintenance program. Representatives of reputable pump manufacturers can provide valuable advice.

PIPES

Professional advice can also help in selection of pipe, a choice based primarily on the water pressures used in the system. The most common piping is made of cast iron. Manufactured in several weights, the pipe and its fittings come with mechanical-type joints and neoprene gaskets to make installation rapid and easy. Some newer systems feature a considerable amount of cement lining applied as a wash to the inside of the cast iron to deter tuberculation.

MAINTENANCE

If properly designed and constructed, the water system should cause little trouble and require little maintenance. The main problem will be leakage. Considerable waste usually occurs within buildings due to leaky faucets and to faucets left partially open. Waste can also occur in the distribution system itself through leakage at pipe joints and valves. Less serious is an occasional break in one of the lines, perhaps from new construction. In these cases, the physical plant department should have an emergency plan formulated ahead of time that details what each person will do. It also needs to keep on file the index map and construction drawings of the mains and valves mentioned earlier.

HEAT

Heat is the one utility usually generated on campus. The primary concern for an institution is how many plants to operate--one or several. In its first stages, of course, a small school could use one furnace in its largest building to also heat its other structures, if any. Once an institution expands to more than half a dozen buildings, however, it faces the basic issue of whether it is more economical to place a small unit in the basement of each new building or to build one large central plant with underground piping system to service the whole campus. To resolve the issue, planners must evaluate a multitude of factors.

First, the case for decentralized heating:

1. The school saves the large expenditure needed to construct a central heating plant and extensive underground piping system.
2. It saves the expense of maintaining the underground pipes.
3. In-building plants lose less heat in transmission.
4. Separate installations eliminate a large unappealing structure that inevitably mars the campus aesthetics.

Despite the advantages, the perceptible trend is toward central plants, largely because of the following reasons:

1. Centralized heating requires only one back-up unit for the whole campus instead of one standby in each building; a substantial economy.

2. Plant design for centralized heat is more economical. Because a central plant will seldom provide maximum heat for every building on campus at the same time, it is not necessary to design in a maximum heat capacity for the total campus. In the event that a simultaneous maximum demand occurs, the main and back-up furnaces can operate for a time on overload capacity.

3. One plant constantly attended by qualified engineers is less likely to suffer serious breakdown than numerous unattended plants.

4. A single smoke stack generates less pollution than several, and treating its emissions is relatively inexpensive.

5. A central plant eliminates the need for stack and furnace space in each new building, thus freeing more usable floor space and saving construction dollars.

6. Conversion to a different fuel is relatively easy with a single central plant. If the energy crisis worsens, this flexibility could become an important factor. If oil becomes scarce and expensive, for example, many oil burning plants could be converted (and in some cases reconverted) to coal.

Also pertinent to the heating questions are local regulations governing the size and operation of heating installations. For large plants, the law requires stationary engineers in constant attendance. The size and power limits for unattended stations vary from state to state, but one general principle prevails: The larger and more powerful the plant, the greater the danger, and the greater the need for qualified engineers. This could be the key to answering the question: When a school plans buildings large enough to require stationary engineers for each separate heating plant, it may find a central plant is feasible in light of the substantial savings on manpower costs.

BOILERS

Given the many types of media, boilers and fuels, the physical plant director who does not have a mechanical engineer on his payroll should hire a consultant to help him select an appropriate heating system. The three widely used heating media are:

1. Conventional hot water, which uses water near but below 212°
2. High temperature hot water, which carries more BTUs per pipe inch by heating water into the 250°-350° range
3. Steam, which comes in low, medium and high pressures

Boilers that generate steam and heat water are cast iron or steel, hand or stoker fed; and burn wood, coal, oil, or gas.

Cast iron boilers come in round and rectangular varieties. They are shipped in sections, assembled in place, and expanded by the addition of new sections and corresponding platework.

Steel boilers come in fire-tube or water-tube types. They are usually shipped in one piece ready for piping connections. Some feature factory installed water jackets, others are simply set in place and refractory lining is installed on-site.

Packaged boilers, as the name implies, are totally fabricated in the factory. Although widely used for smaller heating plants, they come with exotic control systems that can cause problems. Any school purchasing one needs special assistance from engineering consultants and the manufacturer. The purchaser should insist on a strong performance guarantee.

HEAT DISTRIBUTION

The heat distribution system is usually underground. As mentioned earlier, the pipe tunnel is the ideal system, but one which many schools cannot afford. Consequently, direct burial of heating pipe in some kind of protective conduit is the most widely used installation method.

Design and installation of underground conduits must meet the following conditions:

1. Firm foundation to prevent settlement
2. External and internal drainage
3. Capability to withstand corrosion
4. Strength to carry the load imposed on it
5. Effective insulation

To meet these conditions, special care is necessary in selection and installation of valves, fittings, pressure-reducing valves, traps, and supports. Branch connection points should always be located in manholes for proper anchoring, dripping and valving.

Proper insulation requires special attention and must resist fire, water, vermin, and corrosion. It must remain stable in relation to the pipeline, and regain its original insulating qualities after flooding. In addition, it should have the lowest practical heat conductivity.

Pipe selection depends largely on local soil conditions and the availability of piping materials and prefabricated systems.

In an emergency, a college may have to resort to temporary above-ground distribution. When necessary, steam and hot water can be circulated through bare iron pipe, plastic pipe or prefabricated pipe conduits. Insulation is always required, as encasement with plastic, wood, sheetmetal, concrete, tile, pressed asbestos, or some combination of these. If at all possible, above-ground installation should be avoided; it causes inconvenience, endangers pedestrians, and is vulnerable to accidental damage and vandalism.

For information, planners can consult the American Standard Code for Pressure Piping which thoroughly explains heating and piping systems and includes fabrication details from which to write specifications for piping and accessory equipment. The District Heating Handbook published by the National District Heating Association in Pittsburgh, Pennsylvania, is another useful source.

The planner's job does not end with construction. Since the plant requires careful operation and continuous maintenance, he also assists in setting up training programs and maintenance schedules appropriate to the complexity of the installation.

CHILLED WATER FOR AIR CONDITIONING

Air conditioning usually starts as a luxury and slowly grows into a necessity through a haphazard evolution. It begins with window units in those offices operating through the summer. Next comes remodeling that wedges ductwork into older classroom buildings, and then comes central air conditioning designed into certain new buildings. Finally, the school may switch to a central chilled water system to serve the whole campus.

Because planning a chilled water system requires substantial lead time between initial planning and completion, planners must begin early to formulate a definite policy. Air conditioning spreads across campus in bits and pieces, and officials may one day find most of the school already air conditioned by a variety of poorly designed, ugly, uneconomical mechanisms.

SANITARY SEWERS

The aims of a sanitary sewerage program are to collect, treat, and dispose of sewage. *Sewage* is waste matter, primarily human and for the most part liquid with a small percentage of suspended solids. *Sewerage* is the network of piping that carries sewage from the buildings.

DESIGN

A common rule of thumb for sewer design holds that the amount of sewage produced at any particular location approximates the amount of water consumed. Sewers are usually designed to flow full, but not under pressure, through the force of gravity. Wherever possible, the layout should take advantage of the topography to eliminate pumping and its inherent maintenance problems. Exceptions sometimes occur such as inverted syphons and pumps necessary to lift sewage in low spots. It is essential that pipe sizes, pumps and grades be engineered so that stoppages do not occur and velocities are great enough to prevent siltation within the pipes.

The most common piping materials are concrete and terra cotta, although transite pipe is now gaining favor in smaller sizes because of lower cost and easier installation. With all materials, special care should be taken with the joints; they should be as watertight as possible to prevent infiltration of ground water into the system and exfiltration of sewage into the ground.

For manholes, hard burned brick is the traditional choice, but pre-cast concrete manhole rings are prevalent now because of ease of construction. For manhole covers and frames, cast iron is still preferred. It is worth the extra expense to purchase highway grade covers and frames for all manholes, including those in the middle of lawns. With strong covers installed, groundsmen can drive their equipment over the manholes, and planners can stake out new roads through the area without worrying about possible failures.

TREATMENT

The federal government through the Environmental Protection Agency and most states through their health departments now prohibit dumping raw sewage into streams, rivers and other bodies of water, thus outlawing what was once the most popular method of disposal. Under current regulations, the most advantageous disposal method is connection with a municipal sewer system. Cost is figured as a quantity charge or as a direct annual fee, but this option allows the school to avoid many problems associated with operating a sewerage system under current restrictions.

If municipal treatment is not available, the director of the physical plant department must oversee the construction and operation of a campus facility. The smallest system consists of a septic tank with a drainage field or leaching well. A very small school that already has septic tanks and is adding buildings at a slow rate will be tempted to add septic tanks instead of constructing a treatment plant. This does entail problems, however. Septic installations require percolation testing by the health department to determine the porosity of the soil and constructing a drainage field or leaching well at considerable distance from any actual or potential water source. In addition, these devices have a limited capacity and require periodic cleaning and occasional replacement. These and other reasons make them a poor choice in the long run.

For larger treatment plants, the school should retain professional experts for advice on the engineering problems involved, with the many separate operations sewage treatment requires. First the waste enters a settling basin where the solids are allowed to sink slowly to the bottom. Second, the liquid is passed through a filter to remove some of the bacteria and is then piped to a river or stream for final disposal. The sludge that remains is dried, collected and sold as fertilizer. In some variations of the process, the sludge is pumped or scooped from the basin, loaded onto trucks, and shipped to farms or landfills. Because the methods are varied, engineers should analyze them in relation to construction costs, continuing costs, personnel requirements, and quantity and types of sewage.

STORM DRAINS

Storm drains are similar to sewers. They also consist of a network of underground pipes engineered to carry waste via gravity flow. The water runoff it collects from streets, sidewalks and lawns requires no treatment plant, however, only simple sedimentation pits to trap silt. The silt-free water is simply released into a nearby stream or river through headwalls and concrete spillways designed to prevent erosion.

The primary planning decisions about storm drainage center on how the system is laid out and where it discharges. Since drains usually follow the downslope of the topography, layout requires relatively simple engineering. Deciding on the point of discharge, however, requires consultation with the city or regional planning group in charge of the master flood plan for the area.

Since storms can produce sudden heavy loading, drain pipes are usually larger than sanitary sewers. The exact size depends on the rainfall tables and the maximum slopes found in the system. The pipes usually consist of reinforced concrete with brick manholes and inlets. In some locations, however, terra cotta is still preferred for smaller pipes, even though it is more expensive. Most piping is circular in shape, but elliptical piping has proved useful for congested underground intersections. It can be turned on its "side" to allow greater clearance for other buried pipes.

A well-designed system requires little maintenance. Keeping the drains clear is the major task. Siltation can build up in the sedimentation pits and in pipes laid on insufficient grade; dirt and trash can accumulate in catch basins and inlets. The physical plant director must assign men to check these spots periodically and clean them whenever necessary.

ELECTRICITY

Speculation abounds that on-site generating plants for entire campuses may become economically feasible in the foreseeable future. For the present, however, the expense of fuel and generating equipment usually dictates purchase of electricity.

Power delivery today usually comes in the range of 2,400 to 34,000 volts, with 13,000 the most common and suitable primary voltage for small campuses. This means the physical plant department is responsible for transforming high voltage into usable domestic and laboratory power, distributing it , compiling consumption cost records, and operating and maintaining the entire system.

Faced with the complications of high voltage transformers and lines, the department will require the services of electrical engineers and highly trained technicians. A large school can probably add them to the staff; a small school may need to hire outside engineering consultants and private contractors for some of the maintenance work. This question is contingent on plant size, available staff, local conditions and budget.

DESIGN

When designing or revamping distribution systems, planners must analyze four options in terms of economics, aesthetics, and efficiency:

1. Overhead lines with aerial drops to individual buildings are the least expensive and least aesthetically pleasing.
2. Underground direct burial costs more than overhead, but avoids cluttering the campus with unsightly poles and lines.
3. Underground concrete conduits are an even more expensive system, but are more durable with fewer maintenance and repair requirements.
4. Underground pipe tunnels are the most expensive in terms of initial investment, but have the advantages of long life and easy accessibility for maintenance and modifications.

In choosing a system, planners should count on a minimum of 20 years of useful life and provide all the growth expected during that interval, keeping in mind the trend toward increased use of electricity.

A similar design decision must be made about the general layout scheme. The two options are:

1. Radial, in which cables stretch out like spokes or rays from the power source (a central generating plant or major transformer) to the receivers (the individual buildings)
2. Loop or grid, in which the lines are interconnected

The arguments for this choice are essentially the same as discussed earlier in relation to distribution layouts for water and steam. The loop costs more initially but allows operators to switch energy flow in order to backfeed power around any intermediate breaks in the lines. With careful planning, a school can install a radial system initially and slowly develop a loop arrangement as more funds become available.

OPERATION

Any electrical system requires careful operating procedures to prevent costly power failures and dangerous accidents. Skilled personnel, either staff employees or private contractors, are needed, and they must pay close attention to the instructions and specifications in the service manuals of the equipment manufacturers. At least two sets of manuals should be on file for ready reference--one set available to operating and maintenance personnel, and the other a permanent part of the department's records.

A major part of the operation consists of preventive maintenance. The administrator in charge establishes regular schedules for servicing all equipment and keeps careful records of the date and cost of all work done. To set up an adequate program, he first reviews the service manuals that came with the equipment as well as the inspection and operation handbooks published by the major manufacturers of electrical distributing equipment. He should also ask the advice of experienced administrators with similar problems and possibly with greater experience in solving them.

EMERGENCIES

The able administrator should also prepare an emergency plan for total and partial power failure. Such a plan should list the major tasks in order of priority and assign specific individuals responsibility for particular jobs. To be usable in a hurry, the plan could be recorded on a single concise form and distributed to all operating and maintenance personnel, or posted permanently on departmental bulletin boards.

Emergency equipment consists primarily of alternate power systems that provide light for evacuating buildings and continuous service for operating special laboratory and computer equipment. Since the various options range from simple battery packs to small but complex standby generating equipment, special care and professional advice is needed for this decision.

Emergency plans are needed for the entire campus community with information posted on bulletin boards and in a prominent location in the telephone directory.

In addition, the physical plant should have emergency plans for responding to each of the possibilities enumerated below.

IN AN EMERGENCY

Emergency means: FIRE, EXPLOSION, FLOOD, RIOT, SERIOUS INJURY TO A PERSON, UTILITY BREAKS OR OUTAGES.

Emergency generally requires assistance from police or firemen.

1. In case of FIRE, dial 9 to get an outside line. Then report exact location of fire.

2. For POLICE assistance--Campus Security Officers, dial 0.

3. In case of SERIOUS INJURY or CRITICAL ILLNESS, dial Dispensary, Extension ______________.

4. STAY at the SCENE OF EMERGENCY: Get all pertinent facts; get names and addresses of witnesses; report to University/College official when he or she arrives.

5. In case of UTILITY SERVICE INTERRUPTIONS, call Physical Plant, telephone number ____________________.

RECORDS

Careful record keeping is especially important for electrical systems for several reasons. Over the last two decades students have begun using new electric applicances and devices on campus. As a result most schools have at least doubled their power demands per student and per square foot. Some have rewired dormitories to service televisions, air conditioners, refrigerators, hot plates, and hair dryers. Others have tried to restrict student use of power items. A recent complication is the growing nationwide energy crisis, a crisis that may dramatically raise the cost of power or drastically restrict its uses. In the light of changing use patterns and supply conditions, careful and extensive records become essential for intelligent, long-range planning.

The major records, as mentioned earlier, are those for consumption and cost. For predicting long-range trends and forecasting costs, a year-by-year graph of the per-square-foot cost of power is quite useful. For checking plant efficiency and detecting malfunctions, a month-by-month use graph should be compiled for comparison with the monthly rates during previous years. Individual building consumption records are also helpful, but the director should make sure the use of these records justifies the cost of compiling them. In cases where the electric company charges separately for each building, these records are readily and regularly available upon request.

The major recommendations to remember about designing and operating utilities systems are:

1. Insist upon competent professional help during the design stage.
2. Hire design professionals to prepare economic feasibility studies that develop in advance of any decision both the expense and the continuing cost of maintenance and operation.
3. If funds are available, request adequate sectionalizing mechanisms in all designs to allow rerouting and backfeeding in case of failures.
4. Maintain complete and accurate consumption and cost figures to identify large variances and to project future budgets.

Careful designing and accurate records have always been major responsibilities of the physical plant director; they will become increasingly important, however, in an age of dwindling energy supplies and spiraling inflation.

The annual utilities costs will constitute 30% to 40% of the physical plant budget. A good plant administrator must keep his superiors constantly apprised of trends to avoid embarrassing budget deficits.

6

GROUNDS MAINTENANCE

INTRODUCTION.. 233-235
PERSONNEL WORKLOADS....................................... 236-240
  Figure 6-1 : Grounds Division Organization Chart, 50 Acres or Less
  Figure 6-2 : Grounds Division Organization Chart, 75-125 Acres
PROGRAMMED MAINTENANCE.................................... 240-246
  Figure 6-3 : Example of Grounds Inventory
  Figure 6-4 : Example of Grounds Performance Standards and Work Schedule
  Figure 6-5 : Example of Grounds Equipment Inventory
  Figure 6-6 : Sample Equipment Record Card
UNPROGRAMMED MAINTENANCE.................................. 246-250
CONTRACT MAINTENANCE...................................... 251
GROUNDS MAINTENANCE EQUIPMENT............................. 251-256
EFFICIENT AND ECONOMICAL GROUNDS DESIGN................... 257-267
  Figure 6-7 : Mowing Edge Construction
  Figure 6-8 : Dry Wall Drainage Pattern Construction
  Figure 6-9 : Curb, Gutter and Curb-Walk Keyway Detail
  Figure 6-10: Use of Cobbles
  Figure 6-11: Parking Area Mowing Edge
GRASS... 268-277
  Figure 6-12: Lawn Selection Chart and Map
TREES AND SHRUBS.. 277-284
  Figure 6-13: Trees and Shrubs Tables
ENVIRONMENTAL PROTECTION.................................. 284-285

6

GROUNDS MAINTENANCE

THE CARE OF THE CAMPUS--the land around the college buildings--is the responsibility of the institution's grounds division. Known also as the campus crew, or the landscape and grounds section, this division under any name attempts to maintain and hopefully to improve the beauty and utility of that acreage not occupied by lecture halls and laboratories, dormitories and dining halls.

The grounds division does not place these buildings, nor does it create a total design relating the buildings to each other, to the land and to the people. Such work is the job of the landscape architect. The primary purpose of the grounds maintenance organization is to preserve and enhance the malls, plazas, terraces, lawns and walks that the architect lays out. The groundsman plants grass, trees and shrubs; does the mowing, trimming and pruning; patches and paints the roads and parking lots; rakes the leaves and shovels the snow. Such work done poorly leaves a cluttered, sloppy appearance that obscures even the best design. Such work done well cleans the campus face and clarifies its form.

To accomplish these tasks in an era of rising costs, administrators have explored various laborsaving techniques. They have increased the use of machines, programmed their work schedules, and showed landscape architects how to work maintenance-saving features into their designs. By helping schools cut costs without sacrificing service, such innovations have significantly improved the state of the art. As we shall see, each approach has its limitations, but some combination of these techniques can probably help any administrator improve the performance of his grounds personnel.

PERSONNEL AND WORKLOADS

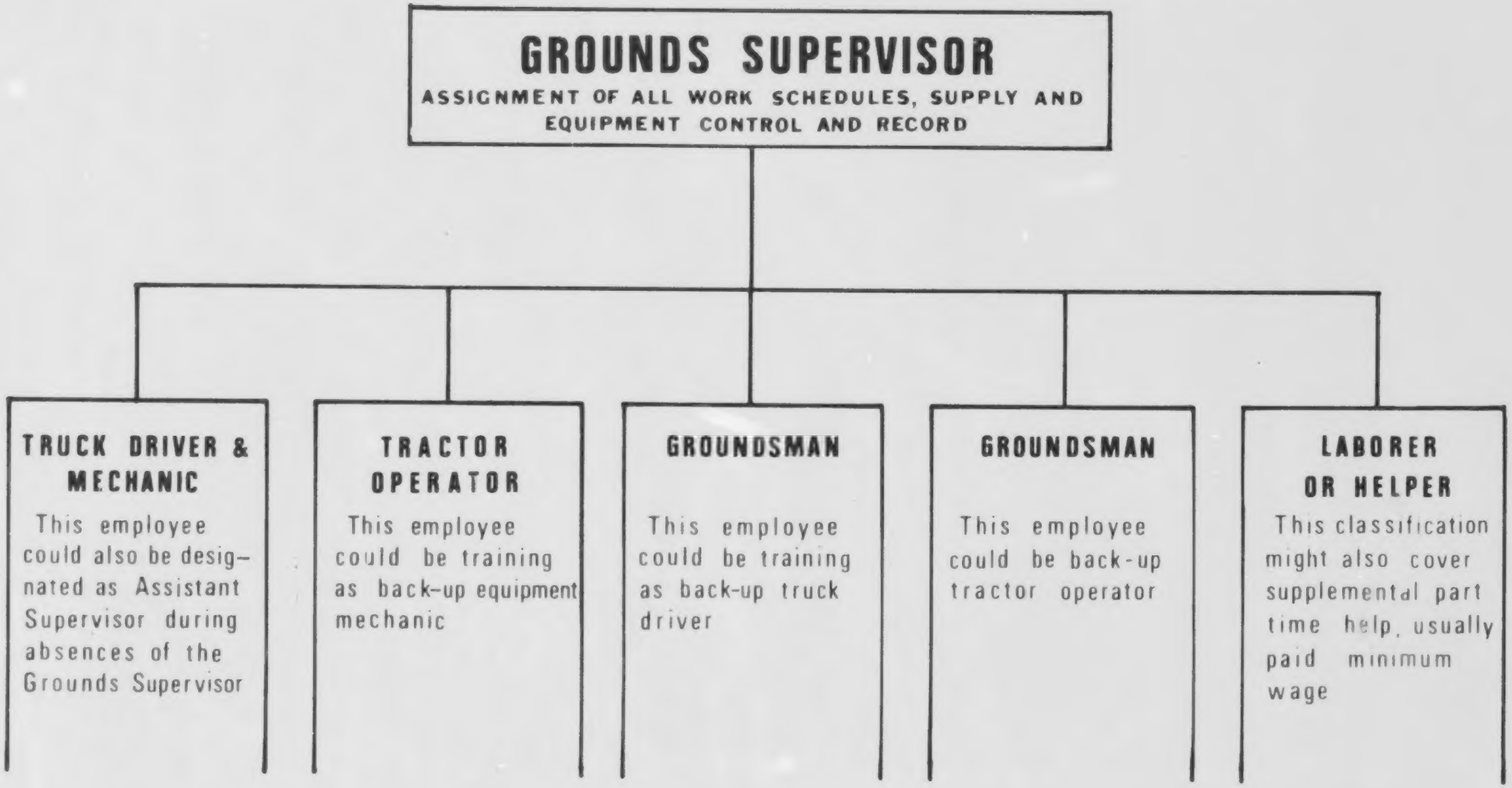
Unfortunately the question of how many men should staff a grounds division has received little study. There are, therefore, few rules of thumb to guide the administrator who wants to organize such a department at a small college. At the very least, however, he would need one experienced supervisor with enough men to handle the following tasks:

1. Repair of roads, parking lots, walks, lawns, storm drains and sprinkler systems.
2. Planting and care of grass, shrubs, hedges and trees.
3. Operation and maintenance of a nursery to provide plants for the campus.
4. Liaison with a landscape architect in development of the general campus plan.
5. Minor landscape construction following the landscape architect's plans.
6. Maintenance and repair of the grounds equipment.
7. Trash pickup, street cleaning, and snow removal.
8. On some campuses, solid waste collection and disposal.

One of the few widely accepted guidelines states that 1 supervisor should head up each group of 8 men. This principle and the job list above yield the organization charts for small colleges of 50 acres or less shown in Figure 6-1.

On a larger campus (75 to 125 acres) or on one requiring intensive care, 2 foremen could be employed, one to supervise hand work and one to supervise the operation and maintain the machines that now do so much of the grounds work. For such a campus Figure 6-2 provides an organization chart divided along these two lines.

SUGGESTED CHART OF ORGANIZATION FOR THE GROUNDS DIVISION IN THE PHYSICAL PLANT OF A SMALL COLLEGE WITH APPROX 50 ACRES



GROUNDS SUPERVISOR

ASSIGNMENT OF ALL WORK SCHEDULES, SUPPLY AND EQUIPMENT CONTROL AND RECORD

TRUCK DRIVER & MECHANIC

This employee could also be designated as Assistant Supervisor during absences of the Grounds Supervisor

TRACTOR OPERATOR

This employee could be training as back-up equipment mechanic

GROUNDSMAN

This employee could be training as back-up truck driver

GROUNDSMAN

This employee could be back-up tractor operator

LABORER OR HELPER

This classification might also cover supplemental part time help, usually paid minimum wage

FIGURE 6-1.

SUGGESTED CHART OF ORGANIZATION FOR THE GROUNDS DIVISION IN THE PHYSICAL PLANT OF A SMALL COLLEGE W/APPROX 75-100 AC.

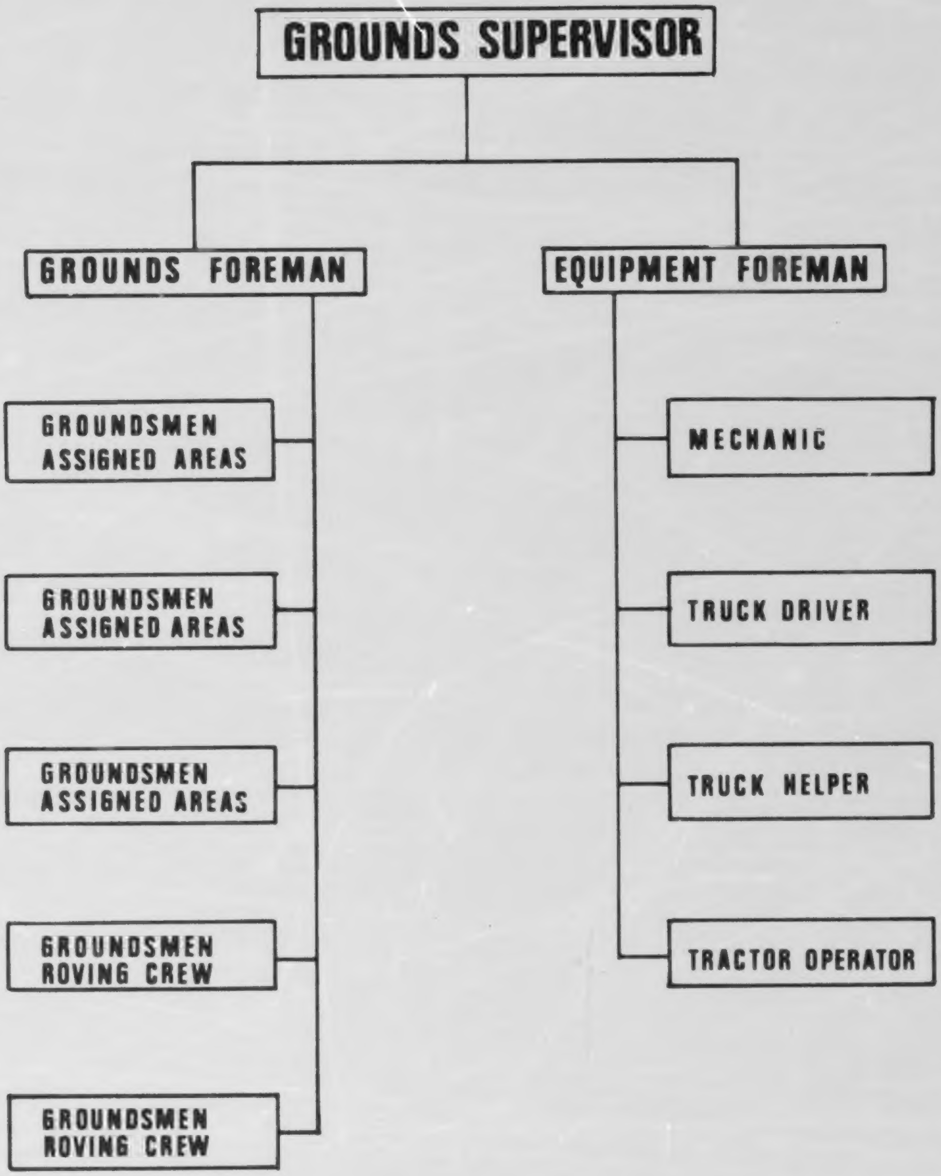

GROUNDS SUPERVISOR
GROUNDS FOREMAN
EQUIPMENT FOREMAN
GROUNDSMEN ASSIGNED AREAS
GROUNDSMEN ASSIGNED AREAS
GROUNDSMEN ASSIGNED AREAS
GROUNDSMEN ROVING CREW
GROUNDSMEN ROVING CREW
MECHANIC
TRUCK DRIVER
TRUCK HELPER
TRACTOR OPERATOR

FIGURE 6-2.

One formal approach to staffing has proved particularly promising. Although developed for the large campuses of the Washington State system of public colleges and universities, this method can be adjusted for use on a small campus. To apply this approach, the administrator must inventory his campus and assign every area to one of these four categories, each of which indicates a different level of care:

> Class 1. Very High Intensity Landscaping. Nearly every campus has certain key areas that require almost daily attention. Campus entrances, plazas, chapel gardens often feature highly refined planting that needs frequent watering, fertilizing, weeding, and pruning. Specific people might be assigned responsibility for particular sections. For these tracts the study recommends a ratio of one man-year per four acres.
>
> Class 2. High Intensity Landscaping. These areas need weekly treatment. Planted borders around buildings and sprinklered lawns with a high incidence of trees and shrubs are the kinds of land requiring weeding, trimming, and replacement of dead plants. One man-year per eight acres is the requirement.
>
> Class 3. Medium Intensity Landscaping. Monthly care can suffice for unsprinklered lawns with a low ratio of trees and shrubs, and for roads, walks, parking lots and other paved areas. Theoretically, one man-year per sixteen acres should be scheduled.
>
> Class 4. Low Intensity Landscaping. Areas having only minor improvements and infrequent use could be left in a fairly wild state with only semiannual or annual mowing and occasional trash pickup. One man-year per thirty-two acres should suffice.

To cover sick time and vacation leaves, this formula calls for one additional man-year for every 12 employees, and it also adds at least 1 supervisor for every 20 groundsmen. The man-year total for the grounds division can then be reached by dividing the number of acres in each category by the standard established for it and then multiplying the result by 1.1375, a figure which accounts for sickness, vacations and supervision. This final man-year total can then be multiplied by the average annual salary to arrive at the yearly salary costs for grounds maintenance.

Hopefully, this formula provides broad-brush guidelines that administrators can refine for conditions on small campuses. If time and money are available, they can try "time-and-motion" studies to measure how long it takes to mow a hilly greensward or to carefully weed a formal garden. If the employees are reliable and motivated, they can time their own work to provide the data for long range staffing programs and work schedules.

Decisions on how many acres are to receive minimal and moderate care may, of course, reflect budgetary problems rather than aesthetic policies. Obviously, the greater the portion slated for very high and high intensity maintenance, the lower the man-to-acre ratio will go. Since this mix of areas varies widely from campus to campus and hinges on climate as well as on financial conditions, it is difficult to recommend one preferred ratio for a total campus. It is equally difficult, however, to imagine any institution doing an acceptable job with an average ratio higher than 1 man per 15 acres, regardless of the land mix and geographical location.

PROGRAMMED MAINTENANCE

The varied and changing tasks a grounds division handles not only hamper staffing by formula, but they also complicate the scheduling of the work. The administrator can plan on some seasonal jobs replacing each other: Grass cutting will yield to leaf raking, which may be followed by snow removal. But he cannot predict the amount of rain and snowfall, or the number, times and intensity of storms, floods, and droughts. Bedeviled by such uncertainties, the best he can do is preschedule those jobs the division must complete every year and prepare contingency plans for those it might have to undertake without warning. The first kind of planning is called programmed maintenance; the second, emergency planning.

Put simply, programmed maintenance means planning work on a preset schedule to minimize unnecessary labor and to prevent costly breakdowns of equipment. Such a system works well for organizing repetitive jobs and even better for maintaining groundskeeping equipment.

THE GROUNDS INVENTORY

The first step in setting up such a system is compiling a complete list of all jobs the grounds division must handle every year. Such a survey must be accurate in order to prevent wasted work or overtime when the program begins. Figure 6-3 shows how this grounds inventory creates a total picture of the campus in terms of the kind of work required for its different sections. Correlated with performance standards and work schedules, this inventory also helps in projecting the annual workload and the division staffing requirements.

PERFORMANCE STANDARDS

Equally important to effective programming are accurate performance standards. To develop reliable standards, several timings should be taken for each identifiable piece of work and then averaged together. These timings should include preparation of equipment, travel to and from the area of work, and final clean up and replacement of equipment, in short, all the time that the groundsman was actually paid for while engaged on that particular task. Figure 6-4 shows a sample table of performance standards.

THE GROUNDS MAINTENANCE SCHEDULE

Next comes the grounds maintenance schedule--the timetable which specifies when, how thoroughly, and how often groundsmen treat each section of the campus. Given the many differences among institutions, each campus needs a maintenance schedule tailored to its particular requirements. Since the frequency of mowing, pruning, and cleaning, will set the general tone of the school grounds, this schedule reflects not just the preference of the grounds division but also the policy decisions of the governing boards or top administrators of the institution. The more money they supply, the more men and machines the division can put on the grounds, and the better the campus will look.

EXAMPLE OF GROUNDS INVENTORY

AREA DESCRIPTION	UNIT
ACREAGE TOTAL CAMPUS	250 Acres
ATHLETIC FIELDS	15 Acres
CONCRETE CURB	20,000 Lin. Ft.
GRASS AREAS ISOLATED (Small islands, terraces)	3,000 Sq. Ft.
GROUND COVER	6,000 Sq. Ft.
HOUSING UNITS – MULTI FAMILY	12 Acres
HOUSING UNITS – SINGLE FAMILY	20 Each
IMPROVED AREAS (Not intensive care areas but must be cleaned & cut periodically)	25 Acres
LANDSCAPED AREAS (All planted spaces receive care)	110 Acres
LAWNS	108 Acres
PAVED ROADS & PARKING	80 Acres
PAVED TENNIS COURTS (Fenced w/fixed net posts)	6 Each
SHRUB & FLOWER BEDS	80,000 Sq. Ft.
WALKS & SEATING AREAS (Measure twice length for edging)	25,000 Lin. Ft.

FIGURE 6-3.

EXAMPLE OF GROUNDS PERFORMANCE STANDARDS & WORK SCHEDULE

JOB	DESCRIPTION	QUANTITY	RATE	FREQUENCY	YEARLY HOURS
LAWN TRASH PICKUP	PICK UP TRASH W/ SPIKE & POLE BASKET OR BAG	180 ACRES	15 ACRES - 1HR.	D'LY. - 365 DAYS	365x12 = 4380
LAWN MOWING	TRACTOR - ROTARY - 6' SULKY - ROTARY - 4' TRIM BEHIND TRACTOR ROTARY - WAL ING - 24" TRIMMING.	150 ACRES 30 ACRES 250,000 SQ.FT.	3 ACRES - 2HR. (8 MON.) 1/2 ACRES - 1HR. (8 MON.) 1000 SQ.FT. - 11 HR. (10 MON.)	WK'LY. 4x8 = 32 WK'LY. 4x8 = 32 WK'LY. 4x10 = 40	32x100 = 3200 32x60 = 1320 40x2750 = 1100
LAWN RENOVATION	REMOVE THATCH, FERTILIZE. OVERSEED	20,000 SQ.FT.	1000 SQ.FT. - 6HR	YR'LY. 6x20=120	1x120 = 120
WINTER GRASS SEEDING	CYCLONE SPREADER 6lbs. RYE GRASS SEED PER 1000 s.f.	10 ACRES	1/2 ACRES - 1HR	YR'LY 20	1x20 = 20
LAWN IRRIGATION	SET & REMOVE 19 QUICK COUPLE SPRINKLERS 3 SETTING	3 ACRES	3HR	6 per YR 6	3x6 = 18
LAWN-EDGE. TRIM. CLEAN.	IN HEAVY PEDESTRIAN TRAFFIC AREA-POWER EDGER	45.000 L.F.	1000 L.F. - 2.5 HR. (8 MON)	2 WKS. 2x8 = 16	16x112.5 = 1800
LAWN-LEAF REMOVAL	HAND RAKING IN FALL	100,000 S.F.	1000 S.F. - 40 MIN.	WK'LY 4x3 = 12	12x66.67 = 800
STREET SWEEPING	18" PUSH BROOM-SWEEP SAND IN PILES ALONG CURB-REMOVE SAND	12.000 L.F.	500 L.F. - 1HR.	MN'LY 12	12x24 = 288
STREET VACUUMING	3HP-WALKING 20" NOZZLE-VACUUM LEAVES ALONG CURBS IN FALL	12.000 L.F.	1000 L.F. - 1HR. (3 MON)	WK'LY 4x3 = 12	12x12 = 144
SHRUB BEDS	WEED, TILL, EDGE	160.000 S.F.	1000 S.F. - 1HR	MN'LY 12	12x160 = 1920
SHRUB BEDS	WEED, PRUNE, EDGE	48.000 S.F.	1000 S.F. - 5HR.	2 PER YR. 2	2x240 = 480
TREE TRIMMING	REMOVE DEAD & BROKEN LIMBS	200 TREES	EA. - 1.5 HR.	YEARLY	300
TREES	REMOVE DEAD TREES & STUMPS	10 TREES	EA. - 5HR.	YEARLY	50
HEDGES	TRIM, CLEAN, WEED	4000 S.F.	1000 S.F. - 2HR. (7 MON)	MN'LY 7	7x8 = 56
WEED & PEST CONTROL	SPRAY FOR FIRE ANTS & WEED IN WALKS, PARKING LOTS, ETC.	20 ACRES	5 A - 2HR. (7 MON)	MN'LY 7	7x8 = 56
TREE PLANTING	TRANSPLANT TREE FROM WOODS TO CAMPUS - COMPLETE	30 EACH	EACH 2½" CALIPER TREE - 5HR.	YEARLY	150
SHRUB PLANTING	PLANT 2'-3' BALLED STOCK	150 EACH	EACH - 30 MIN.	YEARLY	75
LAWN, RECONSTRUCT	ADD 2" TOP SOIL. CRADE. SPRIG STOLONS, ZOYSIA, BERMUDA	50.000 S.F.	1000 S.F. - 10 HR.	YEARLY	500
LAWN, FERTILIZE	10 lbs. PER 1000 sq.ft.-10-5-5 FERTILIZER 48" HAND OP. SPREADER	50 EACH	1 EACH - 2HR.	YEARLY	100
LAWN, LEAF REMOVAL	MOWER W MULCHER 24	100.000 S.F.	1000 S.F. - 11 HR. (3 MON)	WK'LY 4x3 = 12	12x11 = 132
REPAIR ASPHALT PAV.	EXCAVATE, MOD TACK COAT. FILL W/2" PLANT MIX & TAMP OR ROLL	100 S.F.	5 S.Y. - 1HR.	YEARLY	20
COLLECT GARBAGE	PACKERBODY TRUCK 3 MAN CREW RESIDENTIAL CAFETERIA	50 HOMES 20-CANS	10 EA. - 1HR. 1½ HR EACH TRIP	2/WK 8x12 = 96 2/DY. 335x2 = 670	96x5x3 = 1440 670x3x3 = 6330
COLLECT WASTE	PACKERBODY TRACK 2 MAN CREW CAMPUS BUILDINGS	25 STOPS	5 STOPS - 1HR.	D'LY 300	300x5x3 = 4500
COLLECT GROUNDS TRASH	DUMP TRUCK 2 MAN CREW PILED UP LEAVES (3 MONS) TRASH CARS, CURB PILES, ETC.	4 LOADS	1½ HRS. - EACH LOAD	D'LY 20x3 = 60 D'LY 255	60x6x2 = 720 255x2 = 510

FIGURE 6-4.

When coupled with a job order system, this maintenance schedule can key the day-to-day operations of the grounds division. Once the schedule has been developed, it can be laid out on a large wall chart with check spaces on the right to mark completion of daily, weekly, monthly and even semiannual tasks. This chart then serves as a standing job order, or as a reminder to write job orders for major repetitive projects such as mowing, edging, and cleaning. Nonrepetitive, miscellaneous, and emergency work would have to be ordered on individual forms. From these forms and from the chart on the wall, the supervisor can quickly set up job order sheets for the coming week or the next month.

THE GROUNDS EQUIPMENT INVENTORY

Programmed maintenance for the grounds equipment is the same as scheduled preventive maintenance for any machinery. It consists of periodic inspections of each piece of equipment followed by careful recordkeeping of all work performed and parts replaced. Because one can easily point to examples where simple inspections could have prevented a costly breakdown, it is easy to sell policy makers on the value of programmed maintenance for machinery.

EQUIPMENT MAINTENANCE SCHEDULE

Once again, the first step is to compile an inventory of all the grounds equipment similar to the one shown in Figure 6-5. The second step is to set up an inspection and maintenance schedule that provides: (1) daily checks by the operators of items such as battery, tires, brakes, engine cooling system, fan belt, and lubrication; (2) periodic examination by trained mechanics; and (3) seasonal overhauls during slack time. In the course of these inspections, all moving parts are carefully checked and replaced when worn; generally this requires at least annual replacement for major moving parts on heavily used equipment.

This equipment maintenance schedule can also be a large chart listing the equipment down the left side and showing the calendar periods for inspection and maintenance across the top. Another option is maintenance schedule cards for each piece of equipment, arranged by weeks, and kept in one box file with tickler tabs separating each week's scheduled work.

EXAMPLE OF GROUNDS EQUIPMENT INVENTORY

AERATOR -30"	1
BACKHOE-LOADER	1
CHAIN SAW - 24"	1
EDGER, POWERED, GASOLINE	3
MOWER, ROTARY-30"	3
SNOW-BLOWER-30"	2
SOIL SHREDDER	1
SULKY-ROTARY MOWER-4'	2
TRACTOR -	2
" ACCESSORIES	1
" GRADING BLADE, TRAILER,	1
" ROTARY MOWER-6', FLAIL MOWER-5'	1
" ROTARY BROOM-6', AUGER-18"& 6"	1
TRUCK PACKER BODY	1
TRUCK DUMP - 3 CU. YDS.	1
TRUCK DUMP - STAKE BODY	1
TRUCK PICK-UP	1
VACUUM-20" NOZZLE	1

FIGURE 6-5.

EQUIPMENT RECORD CARDS

A third and equally important step is to keep an equipment record card for each piece of machinery maintained. This card should list the dates of purchase, inspection and service; the kind and amount of work performed; and the specific parts replaced. A five-by-eight-inch card similar to the one shown in Figure 6-6 can hold all the necessary information. A box file can hold these cards with tickler tabs separating them into weekly segments. The supervisor should make up the week's maintenance assignments from this, check off each completed assignment and then refile the card under the time period for the next job or inspection. This equipment record card is thus the basis for the inspection and maintenance schedule; it can also identify the recurring problems that signal a major breakdown, establish the best disposal time, and provide the historical data necessary for projecting future maintenance budgets.

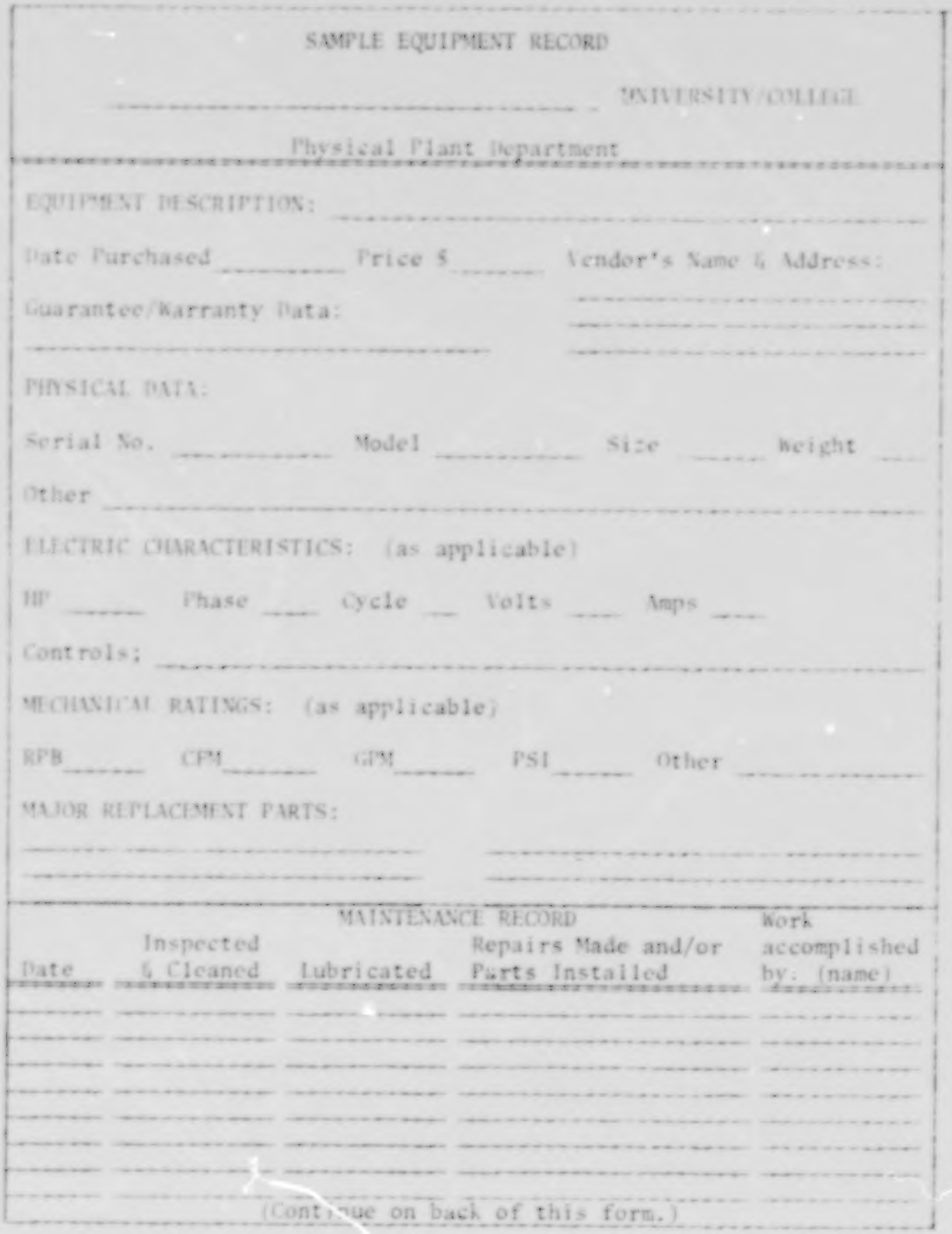
Systematic maintenance will work with any group, if properly organized. In a small college, where the grounds staff may number from 5 to 20 men, the grounds supervisor is the key man. He must be convinced that programmed maintenance will work. He makes up the work orders, assigns personnel, checks on their performance, and keeps the careful records that are essential to the system's success.

UNPROGRAMMED MAINTENANCE

There are limits, however, to programmed maintenance. Although most of the grounds division work can be scheduled by this method, a significant number of tasks are handled as problems develop through the year, and the wise administrator will reserve considerable free time in his annual program for these extra jobs.

MISCELLANEOUS MAINTENANCE

Among the problems that do not develop according to schedule are cracks in roadways and walks, puddles caused by clogged or inefficient drainage systems, and basement leaks resulting from



SAMPLE EQUIPMENT RECORD

________________________________ UNIVERSITY/COLLEGE

Physical Plant Department

EQUIPMENT DESCRIPTION: ________________________________

Date Purchased ________ Price $ ______ Vendor's Name & Address:

Guarantee/Warranty Data: ________________________

________________________________ ________________________

____

PHYSICAL DATA:

Serial No. __________ Model __________ Size ______ Weight ____

Other ________________________________

ELECTRIC CHARACTERISTICS: (as applicable)

HP _____ Phase ____ Cycle __ Volts ___ Amps ___

Controls: ________________________________

MECHANICAL RATINGS: (as applicable)

RPB______ CFM______ GPM______ PSI______ Other ____________

MAJOR REPLACEMENT PARTS:

________________________ ________________________

________________________ ________________________

MAINTENANCE RECORD

Date	Inspected & Cleaned	Lubricated	Repairs Made and/or Parts Installed	Work accomplished by: (name)

(Continue on back of this form.)

Figure 6-6.

water trapped against a building by settling foundation backfill. When several problems develop at once, priorities must be established to insure that the most damaging are treated first and that regularly scheduled maintenance continues.

The wise supervisor also prepares a list of jobs for unscheduled free time. On rainy days when the grounds crews cannot work on their programmed tasks, they can clean, oil, and sharpen their hand tools; make inspections and perform preventive maintenance on the equipment; check the inventory; reorganize the stockrooms; update the records; or perhaps watch training films supplied by manufacturing firms to show how best to utilize equipment.

DEFERRED MAINTENANCE

Low-priority groundskeeping jobs that are postponed are naturally labeled deferred maintenance. Often these are delayed simply because more important problems have to be solved first: Flooded basements, for instance, take precedence over poorly drained pathways. Some tasks must await a propitious time: Pointing up manhole covers and painting lines on roads and parking lots should be done during summer break, when the students are gone and the weather is clement.

Many a low-priority job, however, still requires at least makeshift maintenance to hold it, and this creates another set of problems. Ornamental pruning can be eliminated temporarily, but pruning necessary for the health of the plants cannot, at least not without damage and additional expense. Deep potholes must be filled with gravel or crushed stone until they can be paved. Postponement of such chores will often raise the maintenance price tag: Doing a job poorly and later returning to do it properly creates a larger project and consumes more man-hours and material.

In some cases deferred maintenance will hinder the successful operation of the programmed maintenance. When administrators delay reducing a steep slope, groundsmen will have to cut it with small hand mowers rather than the larger, faster mowers that a good program would specify for such a lawn.

EMERGENCY PLANS

A major cause of deferred maintenance, of course, is the emergency that arrives without warning. A severe rainstorm, hurricane, cyclone, tornado, blizzard, fire, epidemic, or riot can disrupt campus life and demand immediate action from all service departments. Since upheaval can strike so quickly, planning for effective action must precede the emergency.

At the very least, each institution should have ready some general plan of action that each service department can adapt to a variety of emergency conditions. The role of the grounds division in a large scale disruption includes helping control interior and exterior traffic, providing transportation, and maintaining vital equipment and all utility systems in operating condition. Any general emergency plan for the division should cover the following topics:

A. Activation of the Plan. Who can declare an emergency. When and how off-duty personnel are notified to report.

B. Warning Systems. How to operate the campus telephone system, radio station, and fire alarms.

C. Equipment. Which pieces should be readied and manned.

D. Key Locations. Which spots should be manned.

E. Emergency Communications. Battery-operated intercoms, one-way buzzer units, and two-way walkie-talkies can be especially valuable to supplement telephones in an emergency; when the telephone service is disrupted they become the only means of quick communication.

F. The Assignment of Responsibilities. If possible, specific individuals should be assigned by name or title to handle the duties described above.

In some instances, many groundsmen may have to report to a general manpower pool, but in most emergencies it is better to maintain, if possible, the traditional personnel groupings that prevail during the normal work week. Supervisors can assign jobs realistically and delegate responsibility effectively only when they are handling men they know well. Similarly, crew members will respond more quickly and work more efficiently with familiar people than with strangers.

CONTRACT MAINTENANCE

One way for a physical plant department to avoid most of the tasks and troubles discussed so far in the chapter would be to contract with a commercial nursery for landscaping and grounds maintenance. For a small school in particular, this option might prove less expensive than building up a grounds crew and buying numerous pieces of equipment. This alternative does present some problems, however, and the wise administrator will do considerable homework before recommending it.

He will first develop a complete inventory of the grounds, of the levels of maintenance desired, and of the number and kinds of men and machines required to achieve such care. From this survey he can then draw up a detailed description of all the work the private nursery would perform, and also set a price tag for evaluating all bids submitted. The administrator's work does not end with the contract award. He must find or train for the department staff an able supervisor who will carefully and continually check that the firm is complying with all the provisions of the contract.

Another possibility is for the physical plant department to develop a combination of in-house and private contract work. This procedure is often used on the larger campuses for special landscaping and dangerous, complicated maintenance. For example, seldom does a grounds division have a crew trained for high-altitude tree pruning and spraying.

GROUNDS MAINTENANCE EQUIPMENT

Facing constantly rising labor costs, most schools that have chosen to maintain a grounds division have been switching wherever possible from hand work to machine maintenance. Although the widely recognized efficiency of machines has spurred this trend, the following factors have worked to retard this swing: (1) the initial bother of planning, (2) the natural preference of supervisors and groundsmen for their traditional working habits, (3) the problems of personnel recruitment and training, (4) the preparation of the grounds for machine treatment, and (5) the difficulty of selecting the proper equipment.

The reluctance of administrators to plan and of workers to change fall outside the scope of this manual. The problems of recruiting and training are treated in a general way in the first chapter; the preparation of the grounds is discussed in the next section of this one. This section tenders advice on the selection of equipment, and perhaps in the process renders the other problems more manageable.

Well made equipment, when well maintained, will yield satisfactory results, if it is operated properly under the conditions suitable for its use. This principle of efficiency is often stated by the maxim: "The right machine at the right time, in the right place, with the right operator will produce the best job." With the tremendous variety of equipment being produced by private manufacturers, it is usually possible to find the right machine for any particular job. Some of the machines, however, may be less suited than others for use on the small college campus.

In addition to considering the usual criteria of initial cost, availability of parts, simplicity of service, efficiency and durability, the small college supervisor should closely examine the machine's versatility. He should search for the machine that will do the greatest number of jobs in an acceptable manner and perhaps sacrifice some efficiency at one or more tasks in order to gain more use-hours per year. This is perhaps the major principle influencing the general purchasing guide that follows.

TRACTORS

The basic tractor should be the most versatile machine on your campus, and its many accessories should be rugged, easily attached and easily detached. The recommended power range is 20 to 60 horsepower, which means it is definitely not a toy. The recommended accessories are:

Earth Augers. for digging holes for plants, posts and pilings

Front-end Blades. for bulldozing, plowing and grading the earth and for shoveling snow off roads and parking lots

Spreaders. for sprinkling fertilizers on lawns and sand or salt on icy roads and paths

Rotary Brooms. for sweeping leaves and snow from lawns and pavement

Trailers. for hauling

Reel, Rotary or Sickle-bar Mowers. for cutting grass

COMBINATION BACK-HOE AND FRONT-END LOADER

Excessive versatility, however, can occasionally be inefficient, and it is best--if funds are available--to buy a combination back-hoe and front-end loader as a separate piece of equipment from the grounds tractor. Such attachments compromise the performance of the tractor and function more effectively on a machine designed solely for them. Because such a machine is itself so versatile for ditching, grading and loading, it may be used quite frequently by several physical plant divisions. A separate back-hoe and front-end loader leaves the tractor free for the many jobs it can handle.

POWER MOWERS

Lawn mowing on most campuses is the single most costly item in the grounds budget, and after the buildings the lawns themselves are probably the most noticeable feature of the campus appearance. A wise choice of equipment will weigh both economics and aesthetics. The prime economic factor is not initial cost but estimated man-hours required for cutting time. For example, the very best hand-operated power mower cutting an 18-inch swath will require 5 hours to finish 1 acre of lawn under good conditions. A 30-inch mower should cut that acre in 3 hours. A sulky-drawn or tractor-drawn 76-inch reel type mower takes 2 hours, and a tractor-drawn rotary mower 45 minutes. Larger mowers, of course, reduce this time further, but they are seldom found on small campuses.

Here is how the large mowers rate:

> Reel Type. This produces the most attractive finish, but requires a smooth surface and consumes more time for adjusting and sharpening.
>
> Rotary and Flail Type. These perform well on weeds and lawns, however, the rotary mower is more dangerous since it is likely to fling out objects from the blades.
>
> Sickle-bar Type. These have been largely superseded on most campuses by the rotary and flail machines, but they are still used on tractors to cut steep banks, difficult terrain, and to rough-cut outlying areas that receive only minimal care.

The self-propelled riding mower of 25-inch to 72-inch width has proven to be excellent for intermediate areas too confined for towed or gang mowers.

AERATORS

Where soil compaction is a problem, the lawn aerator can be a useful tool. By opening up the ground, it increases percolation of water and penetration of fertilizers and produces a denser turf. Ideal for showplace lawns and athletic fields is the small powered aerator which operates at a walking speed and covers widths of 18-24 inches. For faster coverage of large area, use the tractor-drawn model which can force spoons into the soil by its heavy weight. Where tightly compacted clay is typical, ask for a demonstration before deciding to purchase and check that the spoons penetrate to a depth of at least 2 inches.

LEAF AND LITTER VACUUMS

For rocks, lawns, and walks where the leaf mulcher or truck-mounted vacuum cannot go, the 24-inch powered vacuum is a handy tool for removing leaves. A mulcher which grinds up leaves and distributes them in place is more economical and ecologically sounder.

CHAIN SAWS

The powered chain saw is useful for pruning dead and diseased limbs, for felling trees and for clearing downed trees. Carpenters can also use it to cut heavy timbers.

EDGERS

For creating a "manicured" finish to an important lawn, the gasoline-powered edger is an extremely helpful device. It clips the grass growing over the walk or garden border, and the precise separation it produces between walk and lawn is so attractive it should be required in intensively used areas.

PORTABLE ELECTRIC GENERATOR

The portable electric generator on wheels can be used by several crafts in the physical plant department. On the grounds, it can operate where there are no fixed outlets to powering hedge trimmers, edgers, saws, and emergency lights. The 1-kilowatt size is popular for normal loads.

SPRAYERS

Where insects and diseases may deface, cripple or kill plants, a sprayer should be used to chemically control the threat. If possible, grow those types that are impervious or mildly susceptible to attack.

SNOW THROWERS

The walk-behind powered snow throwers are used wherever the larger snow removal equipment cannot function, i.e., at building entrances in enclosed pedestrian spaces.

TRUCKS

Pickup and dump trucks are indispensible for hauling and snowplowing. They could be purchased in the following sequence:

> The 1/2-3/4 Ton Pickup Truck. This is handy for light hauling, supervision, pickup and delivery, and general utility use.
>
> The 1 1/2 Ton Dump Truck. Building tradesmen and groundskeepers use this carrier for hauling materials, equipment and trash.
>
> The 2 1/2 Ton Dump Truck. Functional for any utility work, this machine is essential for road repairs, for major hauling and for plowing and sanding the main roads and parking lots after a heavy snowfall.

OTHER EQUIPMENT

A wide variety of other equipment needs are also found on the small campus. The need is the same--minimizing hard labor--but the environmental situations vary widely. The urban campus, the rural campus, the frigid campus, arid campus, the lush tropical campus --each requires some specialized tools that are not required by others. Also needed is an assortment of hand tools for pruning, irrigation, earth moving, planting, weed control, etc.

EFFICIENT AND ECONOMICAL GROUNDS DESIGN

Efficient maintenance begins with efficient landscape design. In order to achieve the maximum benefit from their programs and machines, plant administrators have in recent years asked landscape architects to incorporate more labor-saving features into their landscape designs. With each plan the architect should provide an estimate of the man-hours, machines and materials annually required for maintaining his project in good condition. This cooperation aids both the administrator, who can budget more accurately, and the architect, who sees good maintenance preserve the integrity of his conception.

LAWN TREATMENTS

In many parts of the country, grass cutting is the most expensive single item in the grounds budget. A simple way to reduce these costs is to choose a slow-growing grass that requires fewer cuttings each year. Grass selection will be discussed in more detail later, but three slow-growing, attractive grasses that should be mentioned are: zoysia, centipede and some of the hybrid bermudas. Plant growth inhibitors, though less reliable, might be tried on the outlying areas of the campus.

With both slow and fast-growing crops, the spatial design of the grasslands can save or cost the grounds effort many unnecessary man-hours each year. Grass cutting is cheapest when large riding mowers can sweep easily along shaving a wide 6 foot swath. The designer, therefore, should aim at a large, open, unobstructed greensward that will allow a large mower to move continuously at top speed. Smaller lawns can also be cut economically, but only if the operator is able to roll along without tight maneuvering or frequent reversing.

All lawn edges should be laid out with straight lines or with long, smooth curves, none less than 12 feet in radius. For safety, all slopes should be less than 1 foot vertical on 4 feet horizontal; for economy less than 1 foot on 3 feet. Remedial grading can reduce slopes and also eliminate bumpy spots, sunken trenches and other troublesome areas.

Several simple design tricks can reduce the high cost of follow-up trimming with hand tools or small mower. A clear space around trees, for instance, will eliminate much hand trimming completely. Removing the sod will free the space, filling it with sterile sand or wood chip mulch will keep it relatively clear of weeds, and edging it with a heavy metal strip will create a neat, orderly appearance. If the grass is laid flush with the tops of retaining walls and curbs, hand mowing along these boundaries will be unnecessary.

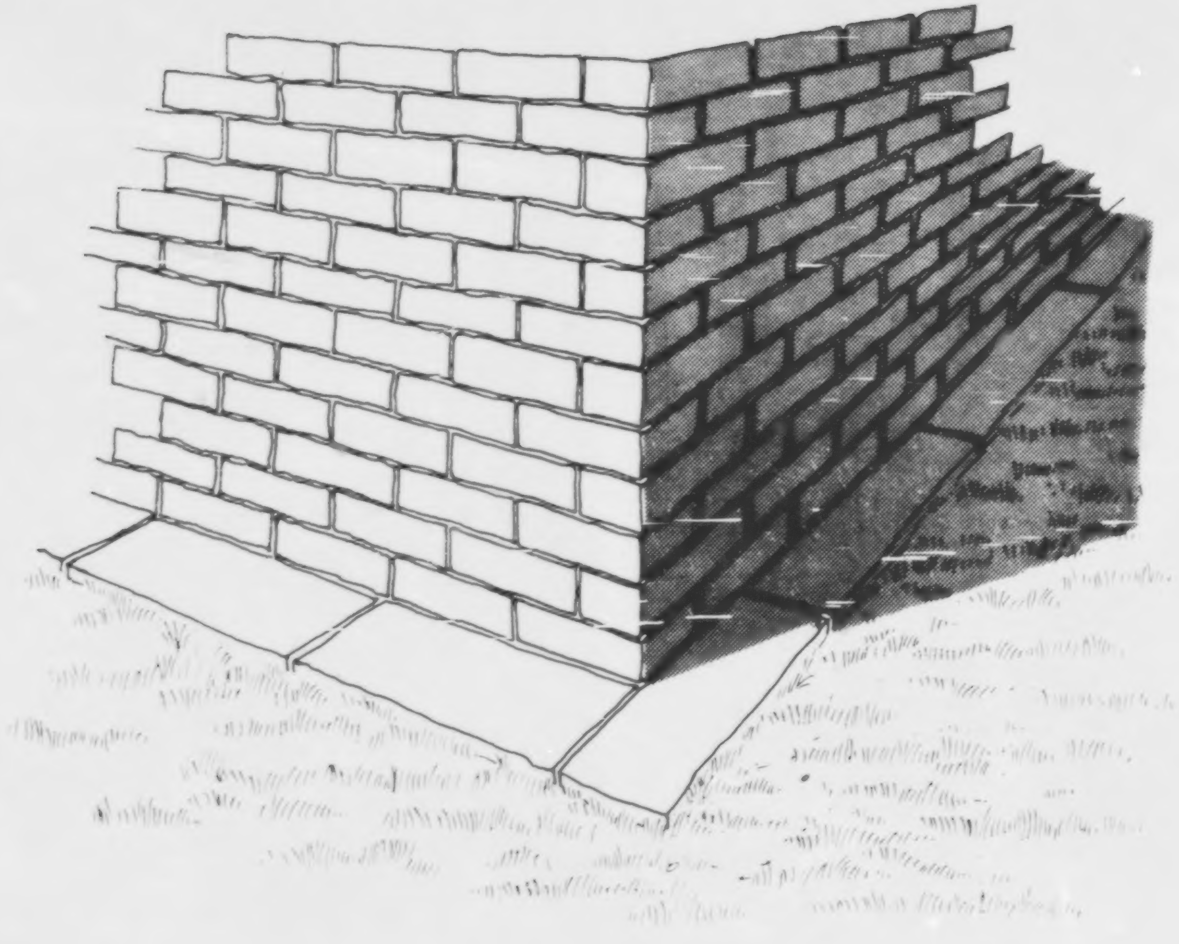
Trimming can be curtailed by installing brick or concrete mowing strips around poles, posts, signs, shrubbery beds, walkways, walls and buildings. See Figure 6-7. The purpose of the strip is to provide a track for the wheel of the large mower. When properly laid, the strip will also prevent damage to machines, establish a hard line for the edger, and control grassy takeover of shrubbery and walks. It should be a minimum of 8 inches wide to hold the mower wheel and 8 inches deep to hold back Bermuda grass. Such a strip also helps clarify and retain the designer's intent.

TREES AND SHRUBS

If the right tree is planted in the right place, its maintenance costs should prove negligble. Because they usually adorn or border lawns, however, trees can raise the costs of mowing if they are not placed properly. To allow easy machine mowing of the area, trees should stand 6 feet away from the nearest curb or obstruction, and they should be planted at least 25 feet apart on a lawn. Trees planted closer than 25 feet should be designed as a group or grove, and the ground beneath should be paved or covered with a low-maintenance mulch.

WALLS

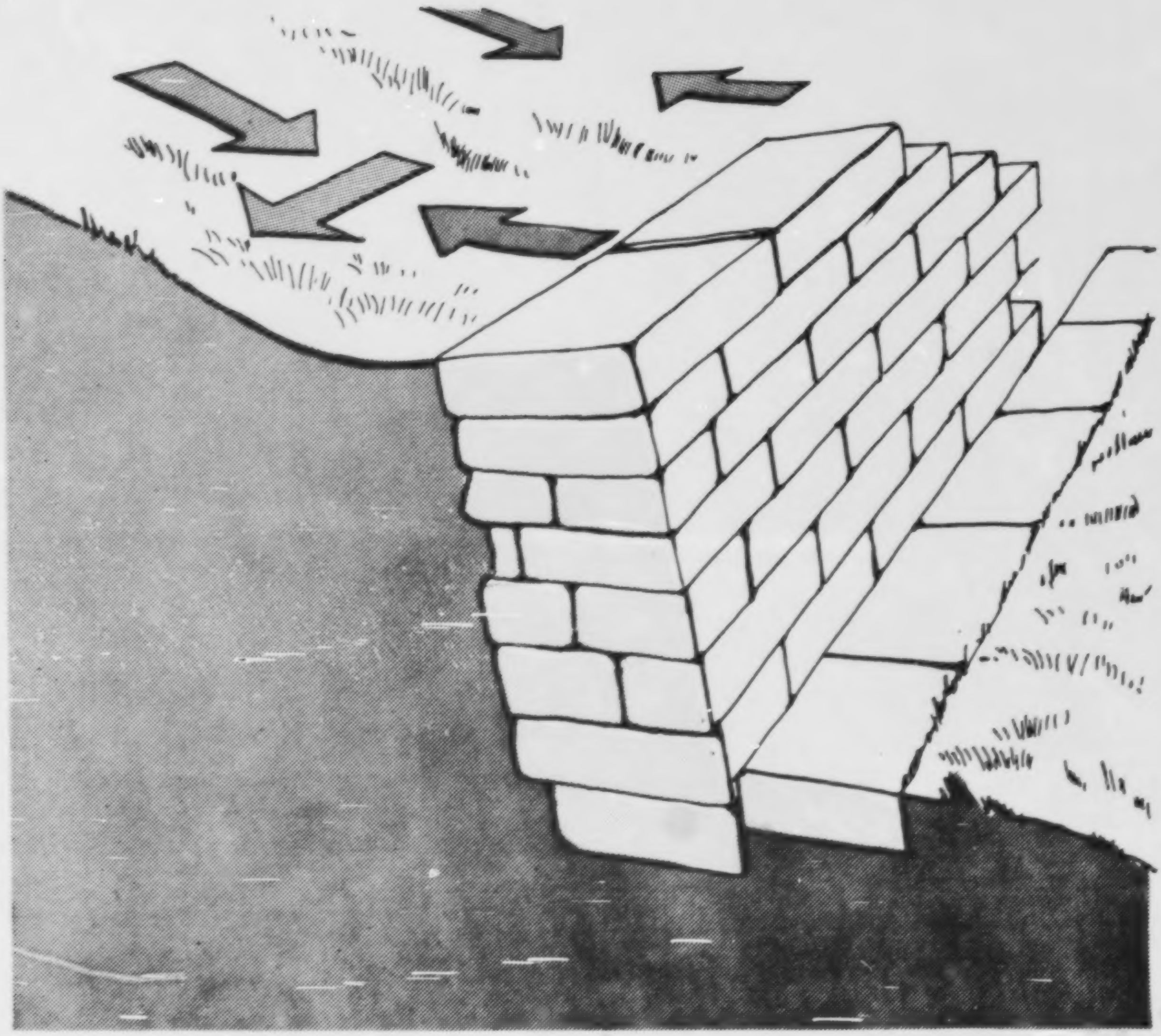
Erecting retaining walls in place of steep slopes is another way to reduce grass cutting costs. Walls less than 3 feet can be constructed without any concrete reinforcement. Higher walls must be built structurally sound with weep holes or swails to release entrapped water. For a long bank, several retaining walls can be mounted in terrace fashion one above the other to the necessary height, thus creating at relatively low cost an aesthetically interesting and easily maintained grade separation. See Figure 6-8.



MOWING EDGE ALONG BASE OF BUILDING

NO SCALE

FIGURE 6-7.



DRY WALL CONSTRUCTION SHOWING BATTER OF WALL AND DRAINAGE PATTERN.

FIGURE 6-8.

RAMPS

Since any obstruction above ground increases mowing costs, ramps should replace steps, wherever possible. Steps are a barrier to mowing machines and to handicapped people moving about in wheelchairs; ramps are especially useful when moving the mowing machine from one level to another. Where steps are necessary in lawn areas, the cheek walls at the sides of the steps should have an inclined top surface graded to match the lawn slope.

STORM DRAINAGE

Effective drainage systems are essential since uncontrolled surface water can damage both buildings and grounds. Surface drains can help handle fast run off, but only a well-designed underground drainage system can provide a complete solution. Periodic inspection and cleaning must be programmed to keep the pipes unclogged.

WALKS AND ROADS

Perhaps as graduates of our institutions, men will walk where paths are laid. Experience clearly shows, however, that for low maintenance on college campuses, paths had best be laid where students walk. This means the shortest, easiest routes between major campus destinations should be paved, or dust and mud strips will soon crisscross the greensward. Some slight control, such as barrier plantings of thorn bushes and strategic placement of benches, waste baskets, and lights, can supplement a good design by deflecting movement around key corners. But such devices can never salvage an impractical plan.

Along roads and drives, sidewalks should be held back 10-20 feet from the curb. This distance not only creates greater safety and comfort for the pedestrian, it also provides the landscape architect with a potential tree zone and the groundsman with a storage spot for plowed snow.

Where walks must be constructed adjacent to curbs, these units should be structurally tied by a keyway inserted in the back of the curb before the pouring of the walk. See Figure 6-9. Such a device ensures that the walk will neither rise and cause tripping nor settle and puddle water.

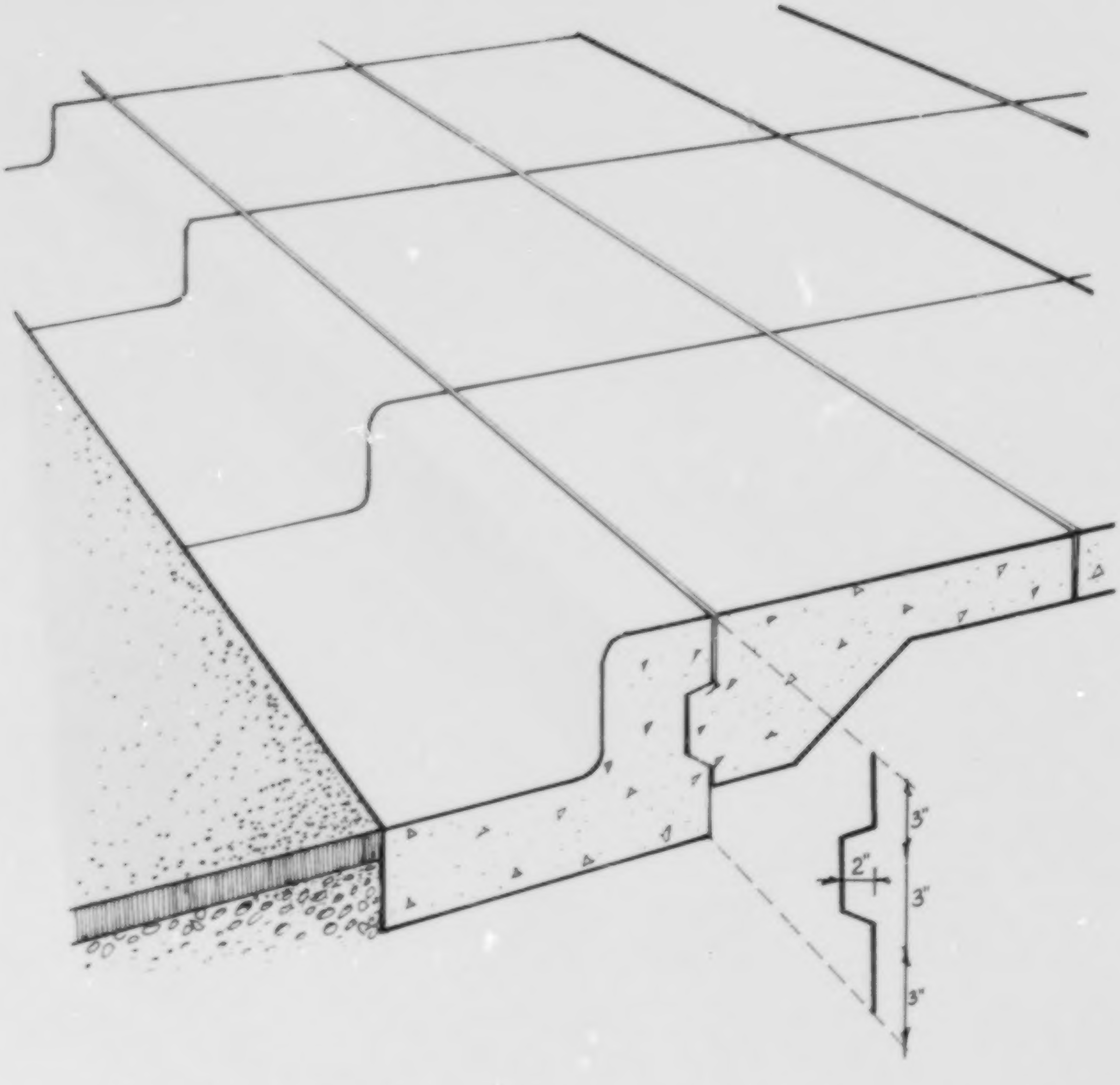
For both walks and roads, concrete pavement provides the most maintenance-free surface, especially in the temperate zones. Asphalt, if properly laid, can also provide a good surface, and at half the cost of concrete. Because it is a softer paving, special care must be taken in preparing the asphalt sub-base to prevent a rash of potholes breaking out after the first snowfall. The Asphalt roadway should always have an integral curb and gutter of concrete, and the asphalt walk should have concrete or other hard material to serve as a header for a powered edger.

Proper maintenance of asphalt requires frequent inspection and immediate treatment of trouble spots. Serious problems can begin in a small area with map cracking, checking or alligatoring of the surface. If neglected, these blemishes may soon spread over the entire roadway, produce potholes, destroy the surface and damage the sub-base. The first symptoms, therefore, should be quickly met with preventive maintenance: skin patching, spot sealing or surface treating.

Traffic signs and control devices along a curbwalk should be set off by a 4 foot square opening in which 3-4 inch cobblestone is laid around the supporting post. See Figure 6-10. Such a surface change gives advance warning to the blind, the unwary, and the stranger. In addition, the signs can be removed or replaced without breaking and relaying pavement, allowing considerable flexibility for sign changing.

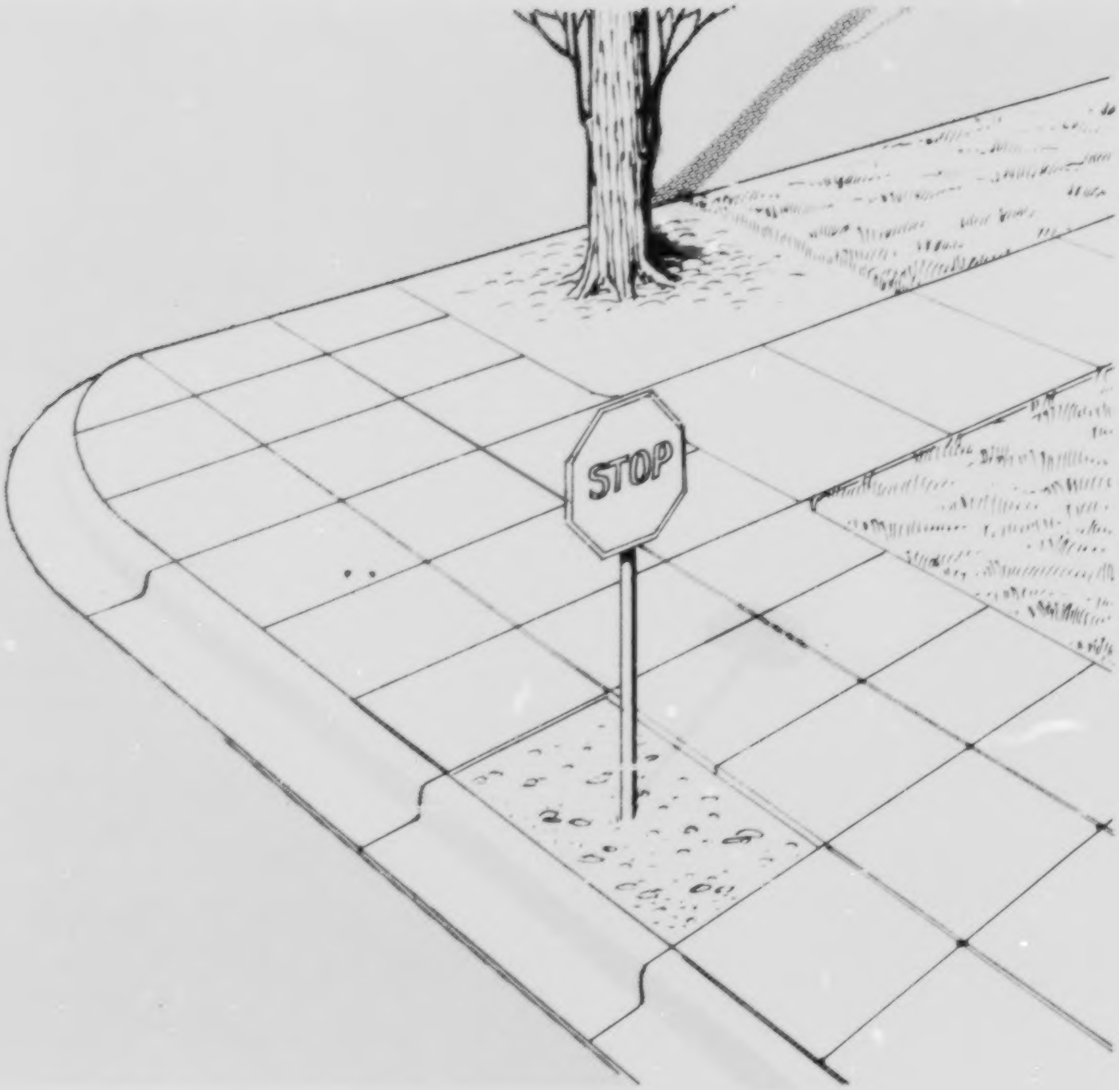
PARKING LOTS

The major maintenance problems with parking lots result from cars intruding onto the adjoining land. Designing double-loaded access lanes will reduce the number of cars parked over the curb and on the grass. Even cars properly parked complicate mowing by hanging over the edge of the lot. If curbing rims the lot, the pavement should extend 2-3 feet beyond it. If precast curb units are bolted on asphalt, a strip of at least 2-3 feet should be left



KEYWAY DETAIL BETWEEN CURB AND GUTTER SECTION AND CONCRETE SIDEWALK TO INSURE STABILITY.

FIGURE 6-9.



USE OF COBBLES AROUND WALK OBSTRUCTIONS TO EASE THEIR SERVICING AND TO WARN UNWARY PEDESTRIANS.

FIGURE 6-10.

260

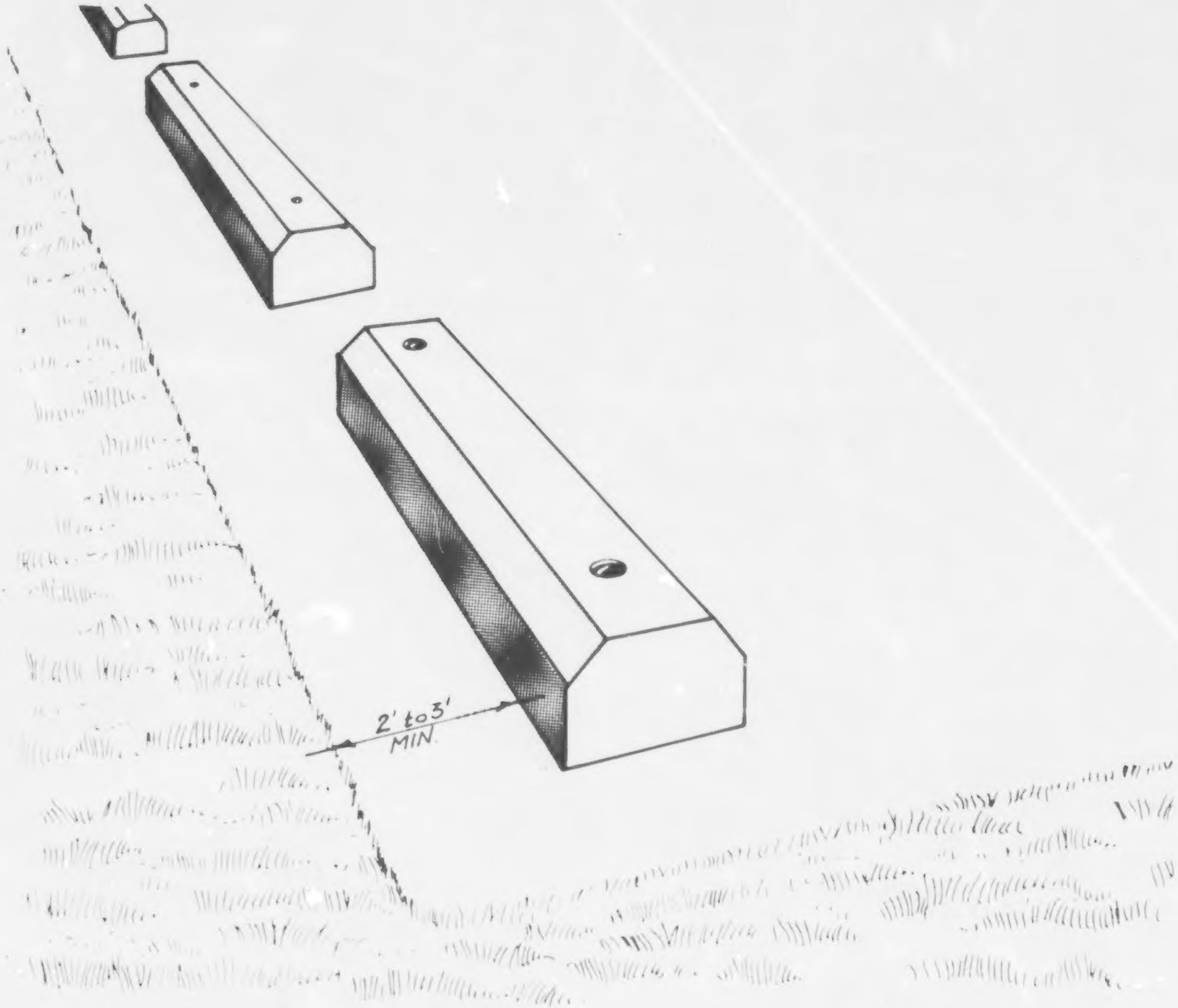
for the mower to grip onto. See Figure 6-11. In cold climates, space for snow dumping should be left free, perhaps at the end of each parking row. Bicycle parking lots should be located more centrally than car lots, if possible, to encourage their use. They should be well-lighted to discourage theft, and should be paved to save groundskeeping time.

CAMPUS SIGNS

Since many signs must be posted about the campus on roads, walks and buildings to inform and direct motorists and pedestrians, creative diversity should be waived in favor of a reasonable uniformity in design, lettering, coloring and sizing. This requires an administrative policy specifying an aesthetic and functional standard to control all signage on campus. Ideally, this standard should be codified in a design manual that takes into account the visual qualities of the campus and tries to harmonize exterior with interior signs. In recent years, many campuses and cities have tried to adapt the international code of traffic symbols which substitutes graphic verbal directions. Helpful guides for organizing a campus manual in light of this trend are: MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS, U.S. Department of Transportation, Federal Highway Administration, 1971 and THE NEW LOOK IN TRAFFIC SIGNS AND MARKINGS, Signs, Signals and Permanent Markings, U.S. Department of Transportation, Federal Highway Administration, 1972.

The location of all signs should be controlled by the long-range campus development plan. In general, eliminate unnecessary poles by collecting several signs on one, where practical. In some cases, light poles can be artfully designed as sign posts, thus reducing the cluttered effect of too many vertical elements.

Since signs must be seen at night, light poles also provide illumination for attached signs. Locate other signs where they will stand in the arc or the penumbra of the light or where they may be spotlighted from another structure. All traffic signs, of course will be reflectorized, but translucent signs with interior illumination may prove expensive and susceptible to vandalism.



MOWING EDGE ALONG ASPHALT PARKING AREAS DEFINED BY PRECAST CONCRETE CURB STEPS.

FIGURE 6-11.

The ability of a sign to withstand destruction should be a major planning factor. One that is flimsy or poorly anchored will soon decorate a dormitory wall. If a steel pipe standard is used, it should never be less than 2 inches in diameter; if aluminum, never less than 3 inches. Reinforce a metal sign by backing it with an angle iron frame or 3/4-inch exterior plywood. Battering the threads on the bolt after it has been tightened will discourage at least the casual sign pilferer.

FENCES

To solve a fencing problem, an administrator weighs values like privacy, security, and aesthetics; analyzes materials like wood, metal and various combinations of the two; and balances the expense of installation against the cost of maintenance. With a substantial outlay he can create complete privacy with a wooden stockade type fence and provide strong security with a chain link fence. Neither will require much maintenance--especially the latter, but neither will be aesthetically appealing unless decorated with climbing vines or flowers. More attractive varieties of wooden barriers are available in the post-and-rail and the split rail types, but they require some maintenance and establish only symbolic privacy and security. Vinyl covered chain link is more attractive, but even more expensive. Cheaper metal varieties such as hog and chicken wire may be better than nothing, but they will not stand up against determined human depredation. With fluctuating prices, more precise cost guidelines cannot be given; a helpful procedure would be to assign some staff member to stay abreast of changes in costs and new development in types and materials. At this point, there is no formula that will produce an easy answer to the fencing problem.

To complicate matters, two additional factors must be worked into the fencing equation. The first is zoning: Local regulations may stipulate which kinds of barriers are permitted in your area. It is best to find this out early before spending considerable research selecting a fence that cannot be erected. The second problem is neighbors. Before starting a boundary fence (or planting) confer with those who will be affected by the barrier to ascertain certain that property lines are mutually acceptable. At least this consideration can prevent bitter feelings later; at the best it can produce a sharing of work and expenses.

GRASS

Except at urban colleges and universities, most American campuses still have more acreage under grass, shrubs and trees than under roads, walks and buildings. Except for the architecture, the most noticeable feature of a school is the extent and quality of this greenery. Whether buildings sit at ease with each other and the landscape is a matter of proper siting and styling, but whether the landscape complements and enhances them is a matter of proper grounds maintenance.

Grasslands cover most of the campus and soak up most of the grounds maintenance budget. To grow and keep a campuswide carpet of strong, green turf requires money first, careful maintenance planning second: The ratio of green to brown should improve in direct proportion to budget increases if the grass program is well managed. If it is, it will be organized around three major jobs: careful preparation of the soil, practical selection of the appropriate sod or seed, and periodic maintenance.

SOIL PREPARATION

Before planting, the following problems must be solved, or the best seed and sod will only turn dollars into dust.

1. Analysis. Testing the soil may reveal chemical deficiencies and even substances harmful to grass. The county or state Agricultural Extension Service can make these analyses for you, as can many reputable commercial nurseries.

2. Texture. If the earth is light and sandy, it cannot hold enough water and fertilizer to support a strong root system. If the soil is heavy or clay-like, it sheds water too quickly and shuts out air. To tighten light soil, work in heavier earth and such organic materials as peat moss, manure, well-rotted sawdust and compost. To loosen tight soil, aerate and introduce sand and peat moss.

3. Drainage. Even nicely textured soil must be drained of excess water. Usually the natural slope of the land will carry off most of the water. Where large, swampy spots develop, remedial grading or buried drain tile should be tried.

4. Cultivation. After establishing the final grade, cultivate the soil to a depth of 3-4 inches using a heavy disk. Remove any large rocks or debris turned up in the process. After periodically soaking and drying, allow the soil to settle naturally before starting a final, shallow cultivation by rake. The final bed should be firm but not packed, with moderately coarse particles ranging in size from a pea to a golf ball. These particles prevent washing, reduce crusting and provide crevices in which the seeds can lodge.

5. Fertilization. Since new plants have greater nutritional requirements than established ones, add fertilizers containing these basic grass foods: nitrogen, phosphate, potash, and calcium. Most commercial fertilizer mixes contain the first three in varying amounts; lime, which also acts as a catalyst, provides the calcium.

SELECTION

Whether to seed or sod is primarily a question of time and money. Sodding is the fastest way to create healthy, durable grass. A well-laid sod covering can take root and bear traffic within a few months. Sod, however, is also the most expensive cover. Because of the cost, sod is rarely used on college campuses, except to prepare or repair heavily used athletic fields and to control erosion on difficult-to-seed terrain. Seeding, on the other hand, is slow but sure. A good fall seeding in most climates will not produce complete coverage until the following summer. But it will do so for less money.

Preparation for sodding is similar to that used for seeding, except heavy soils are cultivated to an 8-inch depth and all soils are heavily watered prior to application. Laying sod is simply and quickly done. Yard long strips are dropped, their ends are butted tightly together, and joints are staggered. As soon as the sod is down, it should be thoroughly watered and daily soaked until the strips have knitted. Watering can then be reduced to two sessions a week totalling 1 1/2 inches. Once established, sod is maintained like any lawn.

The question of which variety of grass to choose is more complicated. Climate, location, use, initial cost and maintenance cost must all be weighed. The chart, Figure 6-12, prepared by the staff of FLOWER AND GARDEN magazine, can start the decision-making process. Check the map for climate area and then consult the chart for the planned use of the lawn to find out the most appropriate varieties. At this point, it is important to consult the state or county Agricultural Extension Service or nearby nurseries. They can provide further information about which grasses flourish locally.

Also ask advice about grass mixtures. Although many companies produce mixtures containing four or five different grasses, some authorities question the validity of this approach. The theory of mixtures holds that the strong qualities of the different grasses can complement each other: Certain types excel in shade, others in sun; some resist disease well, others drought. H. S. Conover, advises choosing one or at most a combination of two predominant grasses that appear well-suited to the particular purpose. Whether buying a single strain or a complex combination, do not economize on seed. Buying the highest quality seed can save considerable expense in later years.

Choosing a mixture of grasses requires further analysis to make sure that the package contains what is required. The law stipulates that grass seed packages label important information about the product's purity, germination, weed content, inert matter, etc. Although these terms contain much important information, they can be easily misunderstood. The following information on how to properly analyze seed package labels was provided by the Scott Company.

WHAT KIND OF A LAWN SHALL YOU CHOOSE?

KINDS OF LAWNS	SUITABLE USES AND SITUATIONS													FORM IN WHICH PLANTED		
	multi-purpose	low to moderate maintenance home lawns	high maintenance home lawns	shade tolerant	seashore tolerant	playgrounds, athletic fields	putting greens	utility yards	heavy traffic areas	temporary nurse grass	economy quick cover	usually combined with other grasses	overseeding to color dormant lawns	seed	sod	sprigs, plugs
COOL CLIMATE KINDS(see map)																
Ky. bluegrasses	x	x	x	x		x		x						x	x	
Fine fescues		x		x								x		x		
Ryegrass (perennial)		x				x		x		x	x	x	x	x		
Northern blends or mixtures	x	x				x		x			x			x		
Bentgrass			x	x			x							x		
Tall fescues						x		x	x					x		
Buffalo*	x	x						x						x		
TRANSITION CLIMATE KINDS (see map) all of the above, plus:																
Zoysias	x	x	x			x		x	x						x	x
Bermudagrasses	x	x	x			x	x	x	x					x	x	x
WARM CLIMATE KINDS(see map) fine and tall fescues, ryegrass, zoysias, bermudagrasses (see above) plus:																
Southern blends	x	x	x			x		x						x		
St. Augustine	x	x	x	x	x			x							x	x
Dichondra		x	x	x											x	x
Centipede	x			x										x	x	x
Carpet		x		x										x		x

*recommended only for arid zones with under 25 inches rainfall a year.

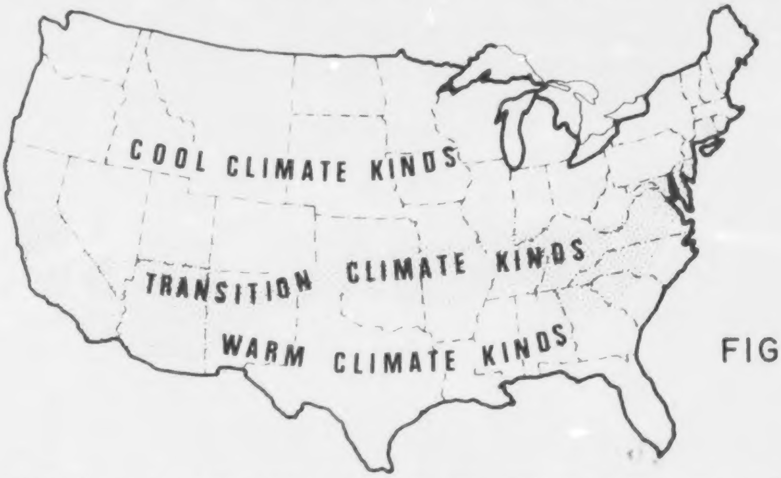


FIGURE 6-12.

BELOW THE TRANSITION AREA, WARM CLIMATE GRASSES ARE PREFERRED. ABOVE, COOL AREA GRASSES ARE PREFERRED. IN THE DOTTED (TRANSITION) AREA ARE FOUND MOST COOL CLIMATE KINDS PLUS A FEW WARM SEASON TYPES.

From "Flower and Garden, August, 1972"

WHAT THE SEED LABEL SAYS	WHAT THE SEED LABEL DOES NOT SAY
PURITY: *The percent, by weight, of pure seed of each component labeled in the mixture.*	All pure seeds are not live seeds.
GERMINATION: *The percent of the pure seed that is capable of growth.*	Young vigorous seed can germinate quicker than older seed. (Like counting all the entrants that finished the 100-yard dash--even if it took several days.)
CROP: *The percent, by weight, of seeds in the package that are grown as a cash crop. Cannot exceed 5% by weight, if not specified by name.*	Timothy and Redtop among many others are grown for cash, but undesirable in turf. All seeds are not the same size - 5% Redtop outnumbers 40% Fine Fescue
WEEDS: *The percent, by weight, of weed seeds in the package. A weed is any seed that has not been included in pure seed or crop.*	One harmless Needlegrass seed weighs the same as 32 obnoxious Chickweed seeds. Both would be listed at 0.27% on the package. 0.1% Timothy would place 127,000 plants on a 10,000 sq. ft. of turf, 0.1% Chickweed equals 560,000 plants on 10,000 sq. ft. of turf.
NOXIOUS WEEDS: *The number per pound or per ounce of weed seeds considered legally undesirable.*	Poa annua is extremely undesirable in turf but only considered noxious in a few states. Even when labeled, consumers often do not recognize it as a problem since it would be called annual Bluegrass.
INERT: *The percent, by weight, of material in the package that will not grow.*	Bulking agents like corncobs or chaff are often added to make larger "bargain" packages. When overdone, sand may be added so that packages will meet weight requirements. Volume of inert can generally be found by multiplying % by weight by 2 (5% inert=10% of bag volume).

The most important fact to remember is that the labels list seed varieties by weight rather than by number. As shown on the preceding chart, one of the desirable seeds may weigh the same as several dozen undesirable seeds, which means that the lawn finally produced may look radically different than the one planned. The way around this dilemma is to convert seed-weight percentages to seed-count percentages before buying. To manage this feat, follow a three step procedure.

Step 1. Multiply purity percentage (a), by number of the seeds per pound of each variety (b), to find the number of seeds per pound in the mixture (c).

(a) PURITY			(b) TOTAL SEEDS per POUND		(c) SEEDS per POUND IN MIXTURE
11.10%	Chewings Fescue	x	545,000	=	60,495
8.50%	Kentucky Bluegrass	x	2,177,280	=	185,069
5.20%	Highland Bentgrass	x	9,072,000	=	471,754
46.50%	Italian Ryegrass	x	226,800	=	105,462
26.00%	Perennial Ryegrass	x	226,800	=	58,968

Step 2. Add all seeds of each variety to find the total number of seeds per pound in the mixture.

Chewings Fescue	60,495
Kentucky Bluegrass	185,069
Highland Bentgrass	471,754
Italian Ryegrass	105,462
Perennial Ryegrass	58,968
SEEDS PER POUND IN MIX	881,748

Step 3. Divide the seeds per pound of each variety by the total number of seeds per pound in the mixture. This determines seed count percentages.

60,495	Chewings Fescue	÷	881,748	=	6.8%
185,069	Kentucky Bluegrass	÷	881,748	=	21.0%
471,754	Highland Bentgrass	÷	881,748	=	53.5%
105,462	Italian Ryegrass	÷	881,748	=	12.0%
58,968	Perennial Ryegrass	÷	881,748	=	6.7%

From the example on the last page, it is clear that the percentage by weight does not give the consumer a true understanding of what he is actually buying. The mixture which seemed to be 72.5% Ryegrass is, in reality, 75% Bluegrass and Bentgrass by seed count percent.

MAINTENANCE

For grass, as well as for the machines that mow it, programmed maintenance can be preventive maintenance. Most of the time nature will take care of the grass by itself, but more often the keeping of grass falls to men and machines. Grass must be watered, fed, mowed and nursed when sick. And if God won't do it. the groundskeeper must. If the groundskeeper waters, feeds and mows the grass regularly, he will rarely find it sick.

Watering

Seeds can lie dry and dormant for many months without harm. Once they begin to germinate, however, regular watering is important to hasten the process, and irregular watering hinders growth because the germinating seed is vulnerable to drying until it is a firmly rooted plant. During the growing season, water should fall twice a day and gently enough to avoid puddling and seed dislodgement. As the seedlings begin to sink roots, they can be watered less often and to greater depth. Under ideal conditions, well-established grass will also enjoy water--at the rate of an inch a week. Such a schedule will keep grass growing quickly and brightly.

Under campus conditions, however, grass is usually watered by rain or not at all. Although all campuses benefit from bright green lawns, few schools can afford the cost of constantly watering and mowing a high-speed growth. Special areas such as athletic fields and chapel gardens may be treated heavily because of frequent use and symbolic importance, but only the wealthy college can carry a total watering program through a rainless summer.

Inevitably, a dry season and a skimpy watering schedule will soon produce thirst symptoms and controversy about how to treat them. When growth slackens, when color darkens and dulls, when blades no longer spring back, more water is obviously needed. In these cases there is little disagreement that heavy soaking once or twice a week is the best way to maintain a section of lawn through drought. However, whether to sprinkle lightly when short on water or leave the lawn alone is a widely debated issue. One expert argues that a little water is always better than none; even applied at midday, a sprinkle can cool the grass and prevent wilt. The opposition contends that brief sprinkles do more harm than good since light watering feeds only the weeds. They recommend saving up for a long, slow soaking and applying it in the late afternoon or evening to reduce evaporation loss.

Well grown grass, fortunately, is hardy enough to survive summers of drought and debate. One of its strengths is its ability to revive quickly with the first autumn rains. If a choice must be made, therefore, it is more important to rescue the trees and shrubs.

Mowing

Mowing is the most time-consuming maintenance that grass requires. On the majority of campuses the frequency of mowing will depend on time, taste and money: on speed of growth, the aesthetic effect desired, and the state of the budget. The primary reason for this operation, of course, is the appearance it creates. Since cutting seldom benefits the grass itself, certain precautions should be closely followed to limit the potential damage.

The major danger comes from clipping too closely. Removing too much of the leaf stalk robs the root system below it of the food it needs. Such clipping also lets in light that may start germination in any dormant weed seeds. The mower blades, therefore, should always be checked before use and never set below 1 1/2 inches, or preferably below 2 inches. If allowed to grow longer, grass will fare better during summer and drought. In no season should more than 1/3 of the grass stalk be cut off at one time.

When the mower blades are checked, they should also be sharpened if dull. A blunt mower blade does shorten the grass, but it can damage it in the process. A dull edge bruises as it cuts, killing the tissue at the top of the remaining portion. As a result, the lawn will soon show a brownish tinge and may eventually fall prey to disease.

Whether or not to remove the clippings depends on how often the grass is mowed and how heavy the clippings are. In general, the heavier the clippings are, the more important removal becomes. Very fine clippings may sift in among the live grasses and form mulches.

but such mulches, if composed of large particles, may harbor diseases. Clumps of clippings atop live grass will smother it. As heavy clippings build up over a period of time they may mat when wet to form a smothering thatch.

Fertilizing

Since grass is mowed so frequently, it must be fed regularly to compensate for the lack of 80-90% of its natural leaf blade. To keep a weed-free, disease-resistant short grass, even well-established lawns require periodic fertilization. The best procedure is to follow the recommendations given by the soil analysis. Next best is to feed the grass three times a year with the important nutrients mentioned earlier: nitrogen, phosphate and potash. In most cases, lawns will be fed twice annually. At the minimum, they should be treated at least once.

Lawns should be fertilized several times each year because nitrogen, the nutrient that colors the grass, usually releases quickly into the soil and leaches away if not absorbed. Urea, a synthetic variant that releases nitrogen slowly, feeds grass well with only two applications a year. Phosphate and potash, however, move through the soil so slowly that heavy application can hold a lawn for several years if necessary.

When buying fertilizers, analyze the labels as carefully as you did seed labels. Figured on the basis of nitrogen content, the cost of fertilizer can vary widely. Check the label, therefore, for the cost per pound of nitrogen rather than for the purported coverage that the total mixture provides. A low cost brand may have such a low nitrogen content that the expense--as well as the work--may prove greater than with a high priced mixture.

When and how often to feed depends upon whether cool-climate or warm-climate grasses were planted. Cool-climate types are usually fed in early fall and in spring. For warm-climate species, fertilizer should be scheduled for early spring and midsummer. If these are also fed in the fall, their dormant period, the fertilizer will encourage weeds. Both varieties, however, can benefit from additional summer feeding.

Weeds, Insects, and Diseases

No lawn enjoys complete immunity from these threats. A strong healthy one, however, has the best chance of continued health, and a sickly one is most likely to suffer further. A thick grass will rob weeds of light and air, resist disease and survive any chemical warfare waged against insect invasion. When copper spot, grease spot, smut and the like appear, resort to research and expert advice before attacking. When cut worm and bill bug infiltrate, do the same. Since early diagnosis improves the chances of a rapid cure, inspect the grounds regularly and teach the groundsmen the symptons they should watch for.

TREES AND SHRUBS

Because the variety of trees and shrubs is so great and the kinds of treatment required so diverse, specialized advice will usually be necessary before scheduling any large planting and maintenance programs. At this point, therefore, only a few general principles will be mentioned to guide initial planning.

SELECTION AND PLANTING

In his GROUNDS MAINTENANCE HANDBOOK, H. S. Conover compiled an extensive list of popular trees and shrubs with cross-references for a variety of qualities and conditions. This table, which is reprinted as Figure 6-13, can be of considerable help in the early stages of plant selection.

Before purchase, however, investigate not only the aesthetic effects and growing conditions but also the cost of continuing maintenance. For a variety of reasons, the cost of maintaining a shrub or flower garden usually runs 300 times the cost of keeping up an equal area of lawn. For this reason, many campuses use shrubbery sparingly as an intermediate element in the landscape and reserve formal gardens, clipped hedges, and the like for a few important spots that have high aesthetic, symbolic or sentimental value. If excessive watering, feeding or pruning will be necessary for the plant to survive and produce the desired effects, this cost--if not forseen-could deflate the budget or dot the campus with ragged shrubs and sickly trees.

PLANT MATERIALS FOR SPECIFIC CONDITIONS

SCREENS--QUICK-GROWING

Trees	Shrubs
Arborvitae, pyramidal	*Buckthorn, glossy*
Douglas fir	*Honeysuckle, bush*
Hemlock, Canada	*Nannyberry*
Maple, silver	*Ninebark*
Pine, Scotch	*Olive, Russian*
Pine, white	*Privet, Ibota*
Poplar	*Privet, California*
Retinospora, Sawara	*Photinia, Oriental*
Spruce, Norway	*Wayfaring tree*
Willow	

HEDGE--FORMAL CLIPPED

Trees	Shrubs
Arborvitae, American	*Barberry, Japanese*
Hawthorn, cockspur	*Boxwood*
Hawthorn, English	*Buckthorn, common*
Hawthorn, Washington	*Buckthorn, glossy*
Hemlock, Canadian	*Euonymus, dwarf*
Hornbeam, American	*Euonymus, winged*
Maple, Amur	*Firethorn, Laland*
Maple, hedge	*Holly, convex leaved*
Pine, white	*Holly, littleleaf Jap.*
Spruce, Norway	*Privet, California*
Yews	*Privet, Ibolium*
	Wintercreeper, bigleaf

HEDGE--INFORMAL

Shrubs, flowering, fruiting or evergreen

Althea, shrub; Arrowwood; Barberry; Deutzia, Lemoine; Deutzia, slender; Euonymus, spreading;

(continued next column)

Forsythia, showy border; Honeysuckle, bush; Hollygrape, Oregon; Juniper, pfitzer; Kerria, white; Lilac, common; Lilac, common white; Quince, Japanese flowering; Rose, Rugosa; Spirea, Anthony Waterer; Spirea, Kashmire False; Spirea, thunberg; Spirea, vanhoutte; Sweetbrier; Viburnum, doublefile; Wayfaring tree; Yew, Brown's; Yew Hatfield

WET LOCATIONS

Trees	Shrubs
Arborvitae, American	*Arrowwood*
Cedar, white	*Buttonbush*
Elm, American	*Chokeberry, red*
Hemlock, Canadian	*Cranberrybush, American*
Hornbeam, American	*Cranberrybush, European*
Linden, American	*Dogwood, Tatarian*
Maple, red	*Dogwood, red osier*
Maple, silver	*Dogwood, silky*
Oak, pin	*Fringetree, white*
Poplar	*Hardhack*
Shadblow, downy	*Inkberry*
Sourgum	*Nannyberry*
Sweetbay	*Rose, swamp*
Sweetgum	*Rose, Virginia*
Sycamore, American	*Summersweet*
Willow	*Willow*
	Winterberry
	Withe rod

(Figure 6-13 continued on next page.)

PLANT MATERIALS FOR SPECIFIC CONDITIONS (continued)

DRY LOCATIONS

Trees	Shrubs
Ash, green	Aralia, five leaved
Birch, gray	Bladder-senna, common
Elm, dwarf asiatic	Blackhaw
Hackberry	Buckthorn, glossy
Locust	Cinquefoil, shrubby
Maple, amur	Dogwood, gray
Maple, hedge	Eleagnus, cherry
Oak, mossycup	Honeysuckle, Tatarian
Oak, scarlet	Indigobush
Pine, Scotch	Juniper, Douglas
Pine, white	Juniper, Sargent's
Scholartree, Chinese	Locust, black
Tree of Heaven	Olive, Russian
Goldenrain-tree	Pea tree, Siberian
	Plum, beach
	Privet
	Sumac
	Tamarix, Algerian
	Tamarix, five-stamen

BERRY-BEARING

Red berries

Ash, European mountain; Barberry, Japanese; Cherry, cornelian; Chokeberry, red; Coralberry; Cotoneaster, Diels; Cotoneaster, ground; Cotoneaster, Frachet; Cotoneaster, rock; Cotoneaster, Simons, Cotoneaster, spreading; Cotoneaster, willowleaf; Crab, Sargent's; Cranberrybush, American; Cranberrybush, European; Dogwood, flowering; Dogwood, kousa; Eleagnus, cherry; Euonymus, winged; Euonymus, dwarf winged;

(continued next column)

Firethorn, Laland; Hawthorn, cockspur; Hawthorn, thicket; Hawthorn, Washington; Holly, American; Honeysuckle, Morrow; Honeysuckle, Tatarian; Photinia, Oriental; Rose, meadow; Rose, swamp; Sweetbrier; Snowberry, Chenault; Sweetbay; Viburnum, linden; Viburnum, tea; Viburnum, Wright; Winterberry, common; Wintercreeper, bigleaf

Black berries

Bayberry, warty; Blackhaw; Buckthorn, common; Buckthorn, glossy; Chokeberry, black; Cotoneaster, Peking; Holly, convex-leaved; Holly, Japanese littleleaf; inkberry; Kerria, white; Nannyberry; Privet, ibota; Privet, regal; Shadblow, downy; Viburnum, Siebold; Viburnum, mapleleaf; Wayfaring tree

White berries

Bayberry, northern; Coralberry; Dogwood, gray; Dogwood, Tatarian; Dogwood, red osier; Spurge, Japanese

Blue-black berries

Arrowwood; Barberry, wintergreen; Barberry, three-spined; Beautyberry, American; Beautyberry, Chinese; Dogwood, silky; Viburnum, Kentucky; Withe rod; Withe rod, smooth

SMALL OR DWARF PLANTS

Abelia, glossy; Almond, flowering; Andromeda, mountain; Arborvitae, globe & dwarf; Azalea, amoena; Azalea, Hinodegiri; Barberry, three-spined; Barberry, warty; Boxwood, common, Cinquefoil; Cotoneaster, ground,

(Figure 6-13 continued on next page.)

PLANT MATERIALS FOR SPECIFIC CONDITIONS (continued)

Small or Dwarf Plants (continued)

Cotoneaster, rockspray; Deutzia, Lemoin; Deutzia, slender; Goldflower; Hollygrape, Oregon; Holly, convex leaved; Holly, Japanese littleleaf; Honeysuckle, Southern bush; Juniper, Sargent's; Leucothoe, drooping; Rose, bristly; Snowball, Japanese; Snowberry; Spirea, Anthony Waterer; Spirea, thunberg; Spurge, Japanese; Stephanandra, cutleaf; Wintercreeper; Yellowroot; Yew, dwarf Japanese

SMOKY. DUSTY, CITY SITUATIONS

Trees	Shrubs
Corktree	*Aralia, five-leaved*
Hackberry	*Barberry, Japan*
Hornbeam, European	*Bladder-Senna, common*
Locust, honey	*Forsythia*
Maidenhair tree	*Holly, Japanese*
Maple, Norway	*Holly, Japanese littlelf.*
Pine, Austrian	*Honeysuckle, winter*
Pine, Scotch	*Kerria, white*
Plane tree, European	*Lilac, common*
Poplar, Carolina	*Nineback, common*
Poplar, Japanese	*Privet*
Scholar tree, Chinese	*Snowberry*
Thorn, cockspur	*Spirea, Vanhout*
	Thorn, Washington
	Withe rod

STREET TREES

Tall, formal and heavy

Linden, American; Maple, Norway; Maple, sugar; Oak, red; Sycamore, American; Tulip tree; Oak, pin; Oak, scarlet

(continued next column)

Medium height for narrow residential streets

Ash, European mountain; Birch, European white; Corktree, Chinese; Goldenrain-tree; Hackberry; Linden, European littleleaf; Maple, columnar Norway; Maple, hedge; Scholar tree, Chinese, Sweetgum

SEASHORE LOCATIONS

Trees

Holly, American; Maple, sycamore; Plane tree, London; Poplar, Bolleana; Poplar, Carolina; Shadblow, downy; Sourgum

Shrubs

Althea, shrub; Arrowwood; Bayberry; Chokeberry, red; Aleagnus, autumn; Hydrangea, Otsaka; Inkberry; juniper, Andorra; Juniper, Bar Harbor; Lilac, common; Olive, Russian; Plum, beach; Privet, California; Rose, meadow; Rose, Wichurian; Sumac; Summersweet; Tamarix

PARTIAL SHADE

Trees

Dogwood, red flowering; Dogwood, white flowering; Fringetree, white; Hemlock, Canadian; Holly, American; Maple, Amur; Sweetbay; Shadblow, downy; Silverbell, great; Sourwood

Shrubs

*Abelia, glossy; Aralia, five-leaved; Barberry, wintergreen; Blackhaw; Buttonbush; Cherry, cornelian; Chokeberry; Cinquefoi. shrubby; Cranberry-bush, European; Euonymus; Firethorn, Laland; *Hollygrape, Oregon; Holly, Japanese littleleaf; Honeysuckle, Morrow; Honeysuckle, Southern bush; Honeysuckle, winter; Hydrangea, oak leaf*

(Figure 6-13 completed on next page.)

PLANT MATERIALS FOR SPECIFIC CONDITIONS (continued)

Partial Shade Shrubs (continued)

*Hydrangea, snowhill; Inkberry; *Ivy, English; Kerria, white; *Laurel; *Leucothoe, drooping; Nannyberry; *Periwinkle; Privet, California; Privet, regal; Redbud, American; Redbud, Chinese; *Rhododendron, rosebay; *Snowberry; Spurge, Japanese; Stephanandra, cutleaf; Summersweet; Sweet shrub; Viburnum, mapleleaf; Winterberry, common; *Witchhazel; Yellowroot; Yew, spreading Japanese*

** Tolerates dense shade.*

Experience Notations:

Experience Notations:

The next recommendation is to spare neither cost nor care in preparing the soil and planting the tree or shrub. A healthy plant requires relatively little maintenance; a sickly one needs constant attention and perhaps eventual removal. Transplanting can be a tricky technical problem; get the best advice on how to handle the selected species and follow it carefully.

WATERING

Once the tree or shrub is planted, the amount of water required varies with the species chosen and the kind of soil in which it stands. Sandy earth which sheds water quickly obviously requires more frequent treatment than clay soils For most shrubs it is best to apply the water slowly and to allow enough time for it to penetrate to a depth of 5-6 inches. On the majority of campuses, healthy trees will be watered only by the rain, except in periods of drought. To help deeply rooted trees flourish in clay soils or survive a dry spell in the best of soils, sink drain tile around the trunk to carry water down to the primary roots.

CULTIVATING

Although cultivating the soil around trees and shrubs does help control and eliminate weeds, it does little to stimulate growth. For that reason mulches are often more beneficial than continual cultivation. Mulches help block out sunlight from the weeds and retain water for the roots. In quantity, the decaying leaves from the plant can develop a fertile protective cover. Straw, cut cornstalks, peat moss, cotton seed hulls, well-rotted sawdust and wood chips are other widely used mulches. By eliminating much expensive hand weeding, 3-4 inches of mulch can usually lower the high cost of maintaining a shrubbery bed. By showing a dark, homogeneous color similar to that of rich earth, it also creates an attractive orderly appearance.

FERTILIZING

What to feed your trees and shrubs is a question for local experts and one they may find difficult to handle. Numerous theories abound, but extensive testing has verified few of them. Research has shown that trees which are fertilized fare better than those which are not, that fertilizer can revive sick trees, and that it matters little whether trees are fed in the height of summer or the depth of winter.

If tree food is required, it can be squirted into the soil with an injector, sprayed on the leaves, or sunk deep in the grounds via punch-holes. The last is the most widely-used method and is best tried in early spring when the soil is saturated. If not moist, soak the ground for several days in advance and then punch the holes with an earth auger or crowbar. All holes should be spaced randomly within the drip line and should extend down to the root level for that particular species. In many parts of the country a program of tree spraying will be necessary to protect or revive the trees from local insect invasions and diseases. Shrubs can also be fed by sprays or the food can simply be added to the soil near the base of the plant.

PRUNING

This is one maintenance service that most plants will require at some stage for their health if not for their appearance. For trees, the first pruning should be done before transplanting. Because the branches are easy to reach with power tools, this is the time to shape and reduce the branch framework to compensate for the loss of part of the root system. Later the tree might be pruned to clear it from service wires, to reduce the amount of shade, and to maintain a desired spread.

More importantly, pruning can fight insects and disease by admitting extra sunlight and air, and it can rejuvenate decaying trees by reducing the strain on the root system. The recommended procedure is to start at the top, and remove closely parallel limbs, crossed and broken branches and superfluous growth at the base of the main boughs. At most schools, high pruning as well as high spraying is usually handled by private contractors.

For shrubs, pruning is necessary for most of the above reasons, but the requirements will vary greatly among the different species. Certain varieties require regular trimming for health, but others may suffer from frequent cutting. For these reasons, careful pre-planting investigation is especially important for the health of the plant and the budget. The methods for pruning shrubs will depend on the aesthetic effect desired, but special care should be taken to cut the top narrower than the bottom, rather than vice versa. A wider top will shade out and eventually enervate the lower branches.

ENVIRONMENTAL PROTECTION

The province of the grounds division comprises more than trees and grass, roads and walks, fences and signs; it includes the total natural environment of the college or university. Protecting the environment is currently everyone's concern, but on the college campus it is the groundsman's profession. Since this is the division's most important goal, protection must be programmed into the schedule for every earthchanging job. On all major projects, safeguards such as the following should be a matter of standard planning and operations.

1. Minimize earth movement by either cut or fill.
2. Control erosion during and after construction.
3. Provide adequate underground drainage in paved areas.
4. Place all utilities underground.
5. Protect existing trees
    a) by erecting 10 foot square wooden barricades,
    b) by not changing the grade over the root mass, and
    c) by not allowing compaction of root-bearing soil by wheeled traffic.
6. Allow no burning of waste.

Chapter 6
GROUNDS MAINTENANCE
Environmental Protection

Maintenance is often defined as delaying the deterioration of the status quo. This is inescapably true for buildings; it need not be so for the land on which they stand. By repairing the ravages that men, machines and buildings wreak, by replenishing the earth, the efficient groundskeeper does more than postpone decay; he keeps the land for those who follow.

231

7

MAJOR REPAIRS, RENOVATIONS and ALTERATIONS

INTRODUCTION.. 287-290

THE PLANNING PHASE.. 290-303
    Figure 7-1: Typical Form of Program Checklist
    Figure 7-2: Combined Request and Estimate Form for Typical Project
    Figure 7-3: Form of an Estimate

THE DESIGN PHASE.. 303-305

THE CONSTRUCTION PHASE...................................... 305-310
    Figure 7-4: Drawings and Specifications for a Small Project
    Figure 7-5: Sample Initiation and Coordination Instructions for a Minor Alteration or Improvement

THE POST CONSTRUCTION PHASE................................. 310-311

7

MAJOR REPAIRS, RENOVATIONS and ALTERATIONS

FREQUENTLY THE PHYSICAL PLANT DEPARTMENT is assigned extra projects as major as converting a large lecture hall into a specialized scientific laboratory, or as minor as installing additional electrical outlets in an office switching from manual to electric typewriters. Such work may be handled by an in-house design and construction team, by a professional consultant, or by some combination of personnel. This variety in types and methods means these projects seldom fit neatly into the operating procedures standard at many physical plant departments. Which means that many administrators unnecessarily postpone important improvements (or at least try to) because their offices are not organized to expedite the unusual. In the end such delays can cost the school money and damage the physical plant department's reputation for efficiency. This chapter will consider how to avoid or at least mitigate such evils.

Definition is again a problem, and a major one, since it determines who pays for the work and how it is accomplished. Two negatives are important: (1) These projects are not maintenance jobs that the department budget normally covers. Funds for planning, estimating and construction, therefore, should come from sources other than the department's operating budget. (2) These projects usually do not add new floor space to the school's inventory. Responsibility, therefore, probably should fall to the institution's planning and funding committee rather than to a departmental committee. The physical plant department should not be expected to set priorities on use of funds outside of its own operating budget.

A more precise definition comes from the Association of Physical Plant Administrators. It recommends a separate funding category for major nonrecurring repairs and major deferred maintenance items. "Major projects," it states, "are those normally costing in excess of $10,000.00." Since this figure is meant to apply to the University of California, Los Angeles as well as Tuskegee, a small school could lower the limit, perhaps into the range between $1,000.00 and $5,000.00.

What is important is that the physical plant department and the institution set some definite figure which defines a project as special and beyond the normal scope of the department's operations and funds.

More examples may help. Replacing roofs, walls, floors, ceilings and wiring systems are major repairs: They are larger in scope, require more money and occur less frequently than regular maintenance. So do simple renovations like subdividing space for new occupants. Major alterations are easier to identify. They might include building in language laboratories with tape recorders, public address systems, and individual booths; installing closed-circuit televisions in all the classrooms of a particular building; or creating specialized laboratories for analyzing photographs of atom-scattering experiments.

Requests for these and similar projects may come from any academic, administrative, or service department within the school. Occasionally the request will originate with a change in teaching methods, as with the laboratories required for audio-lingual instruction. Frequently it will develop from a research program funded by the federal government or private industry. More often the job will result from growth that must be accommodated before new buildings can be designed, financed, and constructed. Because small schools do not have many programs, personnel, and research grants to administer, they do not handle as many of these changes as large universities do. Because these improvements can be so important, however, every physical plant department should be able to tackle them quickly with flexible, organized planning.

THE PLANNING PHASE

On this kind of job, the planning process will often be seen circling back upon itself instead of always advancing one complete step at a time. Renovations and alterations, in particular, are notorious for growing more complicated and more expensive, simply because it is impossible to forecast all the problems that can come out of the woodwork and brickwork when men alter the original structure of a building. What started as a simple job may ultimately require more complicated planning than new, much larger buildings do. This is one reason why architects usually charge a higher fee percentage for this type work than for new designs. Reviewing, rethinking, redesigning and even refinancing may attend the job from inception to completion, or one review may cause its cancellation somewhere along the line. Until that point is reached, however, the planning process should be organized to keep things moving--if not marching forward in a straight line, at least coiling outward toward final completion.

THE SCREENING PROCESS

Requests for repairs, renovations and alterations can come from any academic, administrative or residential department on campus. All serious requests, however, should be put in writing and passed up the administrative channel for signatures by appropriate chairmen, directors and deans. Each request should explain how the project would be funded. These requests should not come directly to the physical plant department. They should go first--accompanied by written justifications--to a standing committee whose sole purpose is to receive and evaluate such requests, establish priorities, assign funds, and review progress. This kind of planning group can be found on most large campuses under one of the following titles:

School Space Committee
Academic Improvements Committee
Academic Betterment Committee
Special Projects Committee
Departmental Improvements Committee

To produce realistic decisions, this committee should either include representatives of, or seek guidance from, the following groups:

1. Financial Administrators. They will know what the school can afford and when the money will be available.

2. Academic Personnel. They will evaluate the importance of the proposal to the quality of instruction and research.

3. Students. They can contribute when the project will affect them.

4. Physical Plant Personnel. They can examine the impact the project will have on plant facilities.

It should be this committee, and not the physical plant department that decides which projects should be shelved, which pursued further, and which completed. Such an arrangement saves the physical plant department the agony of deciding on matters outside its field and keeps it free of campus politics and accusations of favoritism.

In some cases this committee will decide immediately to commit the school to a project. Often this will occur when federal grant monies are paying all or most of the costs; sometimes it happens when the school has to correct code deficiencies endangering health, sanitation and safety. In these few instances, the project moves directly into the design phase. Most repairs, renovations and alterations, however, are subject to additional preliminary analysis before final approval.

PRELIMINARY APPROXIMATIONS OF COST

Once this committee decides to investigate a repair, renovation or alteration, the physical plant director should take charge and provide the leadership to keep the project moving through the preliminary studies, the detailed designs, and the actual construction work. These matters are his specialties and given sufficient money, the success or failure of the project will depend primarily on his performance and that of his staff.

"How much?" is the first question the director has to answer, and at this point, he has little information to use in developing figures. He may have to start with rough square footages for the basic materials without close consideration of any special equipment involved. On the basis of such information, the best he can do is use experience records to produce a "ballpark figure," "guesstimate," "horseback estimate," or even "SWAG"--one administrator's acronym for sophisticated wild-ass guess. Even though these first approximations are uncertain, they are very important, since they tend to encourage or discourage further investigation.

FEASIBILITY STUDY

The next step is a feasibility study, to develop all the information that the committee should need to make an informed, sensible decision. In the course of this study, planners identify the nature of the problem, evaluate the building that is supposed to house it, explore all realistic options for solving the design and construction problems involved, and confer with the business officer about possible source of funds. Planners can then circle back on the first cost estimates and refine them into a more accurate reliable number. At that point, the department makes recommendations to the special committee about how to approach this particular project.

The Purpose of the Project

Identifying the nature of the problem requires frequent consultation with the asking department. If the department chairman involved does not have time to devote to this planning, he should assign someone else to work closely with the physical plant staff throughout the planning, design and construction phases. Staff planners ask this representative questions such as: What exactly are we trying to do? What function will the improvement serve? Professors--like kings, presidents and homeowners--can easily become so excited by their grand designs for old buildings that they forget the original function of the renovation or alteration. The planners, therefore, must ask many hard questions at this point. A guide to these questions is shown in the Program Checklist in Figure 7-1. Only after they clearly understand the special purpose of the improvement, can these professionals put their special talents to work.

The Physical Survey

Once they have defined the nature and scope of the project, the physical plant in-house engineers or a professional consultant should initiate a technical survey of the building to be altered. Is it strong enough structurally to bear the load of new walls and equipment? Must the electrical and mechanical systems be reworked to accommodate the new demands? At this point, many projects run into financial problems as planners find that floors have to be reinforced to hold heavy computers, that walls planned for removal are load-bearing, that the building must be rewired to handle the air conditioning. This survey, therefore, is one of the key elements in a feasibility study.

Optional Solutions

The next major element--the search for solutions to these problems--requires as much tact as talent. Often a member of the department requesting a project concocts the "perfect" design, without benefit of a technical survey of the building. In these cases, planners find "pride of authorship" more vexing to circumvent than load-bearing walls scheduled for removal. Since most men--academicians, administrators, or engineers--commit some part of their souls to their creations, planners must often play diplomat to keep the project proceeding harmoniously. Professionals, of course, are not immune to the ravages of creative fever, but they can at least diagnose when the disease is enfeebling the planning process. When a solution proves unworkable, they must do more than disparage it; they should explore the alternatives, trying to incorporate the best elements of previous plans.

This exploration is another example of how planners circle around a problem. For the feasibility study, the investigation of alternative solutions is only tentative. The staff only roughs-in alternative designs in order to indicate solutions to technical difficulties and to further refine the cost estimates. Either in-house or private consultants will later cover the same territory once more in order to develop detailed drawings and final estimates. These later stages will show exactly how the school can finish the project. In the feasibility stage, however, the primary question is whether the school can accomplish this improvement within the limits established by the building and the budget.

Answering this question requires help. The first place to turn was already mentioned--the faculty. They are experts in their fields, and have had firsthand experience in teaching and research. Even though an instructor may not be a member of the requesting department, he may be an expert on an engineering or environmental problem the staff is struggling to solve. Consult him; he will be flattered, and he may provide excellent advice at no cost.

Excessive consultation, however, diverts faculty from their primary roles of teaching and research and creates the impression that the physical plant department could not fulfill one of its primary functions. If the requesting department has no connection with the construction field, planners can expect little beyond general advice. They can "pick the brains" of interested faculty in hopes of finding useful ideas and creating a sense of cooperation on a joint venture. At the least, this will give the faculty some understanding of the problems and should produce some appreciation for the solutions finally attempted.

Books and journals can be another source of information. Like the committed scholar, the competent physical plant administrator should keep current with the literature in his field. To evaluate and supplement the reference shelf, examine the extensive bibliography accompanying this manual. In addition, have the department or school library subscribe to such major periodicals as American School and University, Buildings, College and University Business, and Engineering News Record. One logical method for keeping tabs on the information in these journals is to review each issue, clip pertinent articles, and file them under appropriate headings in a folder, cabinet drawer or loose-leaf binder.

Additional extramural help can come from various sources. Colleagues in the Association of Physical Plant Administrators can provide expert general advice through correspondence or over the telephone. Major suppliers, if handled carefully, can provide important technical information on materials and methods, and some may also give rough estimates that will help planners develop or double-check their cost analyses. Ask advice, however, only of those who have in the past shown real concern for, and understanding of, the school's problems. For difficult, state-of-the-art problems in acoustics, electronics and interior decoration, it may be necessary to employ a qualified consultant at this stage. Even private architects and engineers may be needed; but the director should emphasize that their assistance during the feasibility study will cover only general advice, will not entail detailed drawings, and will not obligate the school to award them the final commission.

The Second Cost Estimate

From this exploration of options should emerge the best solution--the one that handles the technical difficulties within a manageable budget range. Conferring with the institution's business officer is essential at this point, since it is he who knows how much money is available. To avoid disaster later, planners must present him with the whole package as they see it. From these conferences come the final compromises or expansions that the economic situation dictates or allows. If the business manager does not have a complete and realistic picture of the project, it may flounder later due to lack of funds--a situation certain to spark anger on the part of the financial administrator and dismay on the part of many others.

To present a clear picture, physical plant planners need a cost estimate that is more detailed and hopefully more accurate than their first "ball-park" figure. This second cost approximation, however, is not the final one. Although the time for "guesstimating" has passed, the time for the final hard figure is yet to come. At this point, the best the staff can do is compile "a quantity and unit price take-off" that includes the price of installation and labor, and then tack on a 5%-10% contingency item. Since the job has not yet been put out for bids, the figures must come from building costs handbooks like BUILDING CONSTRUCTION COST DATA, published by Robert S. Means, Co. of Duxbury, Massachusetts 02332, and from dependable contractors friendly enough to give their estimates for all or part of the job. Figures 7-2 and 7-3 show the kinds of forms administrators can use for these computations. These numbers must be handled with caution and carefully explained to decision-makers, lest they lead everyone astray. Assembling impressive statistics is easy, assembling dependable ones is difficult, even late in the planning process.

Recommendations

The penultimate step in the feasibility study requires writing a staff proposal for accomplishing the work. After developing a first draft, planners should again consult with the requesting department. Although planners may have followed what sounds on paper like a logical procedure, the asking department may still find deficiencies in the proposed solution. If so, the responsible planner will attempt to rectify errors, to incorporate practical suggestions or to explain why he cannot do so. Since memories are fallible, it would be wise at this point to secure the asking department's written approval of the proposal before submitting it to higher authorities for final consideration. If disagreements develop later, these documents can resolve them, saving unnecessary bickering about who agreed to what.

After reviewing the total project, the physical plant department presents the revised proposal to the committee that controls departmental improvements. This document includes staff recommendations about methods, costs, and even about the value of the improvement. This last statement smacks of heresy, since value judgments about educational improvements usually lie outside the expertise of the physical plant department staff. It is possible, nevertheless, that the feasibility study may reveal that the proposed renovation or alteration cannot accomplish the intended objective. This may be the rare instance, but the planners should feel free to express their opinions--after the investigation, but not earlier.

TYPICAL FORM OF PROGRAM CHECKLIST
for use on
JOB SITE ANALYSIS

Project Number ____________ Date ______________

BUILDING ______________________________ Room Number ______________
DEPARTMENT ______________________ Dept Rep ______________________
AREA ______________________________
Net Assignable Sq. Ft.

Present Use:

Projected Use:

STRUCTURAL CONDITIONS

FLOORS
Type: Slab ☐ Wood ☐
Condition. Good ☐ Fair ☐ Bad ☐

Finish: Tile ☐ Terrazzo ☐ Fin Conc ☐
Wood ☐ Other ______________________________
Good ☐ Fair ☐ Bad ☐

WALLS
Type: Wood Stud ☐ Metal Stud ☐ Masonry Block ☐
Other ____________________
Finish: Gypsum Board ☐ Plywood ☐
Pre Fin Paneling ☐ Wallpaper ☐
Vinyl Covering ☐ Ceramic Tile ☐
Glazed Tile ☐ Plaster ☐
Condition: Good ☐ Fair ☐ Bad ☐

CEILING
Type: Slab ☐ Dropped Acoustic ☐ ____" x ____"
Plaster ☐ Fin Conc ☐ Other ______________
Condition: Good ☐ Fair ☐ Bad ☐

ELECTRICAL

POWER AVAILABLE
Phase ____ Cycle ____ Volts ____ Amps ____

LIGHTING
Type: Incandescent ☐ Fluorescent ☐
Mounting: Surface ☐ Hangers ☐ Other ______________
Condition: Good ☐ Fair ☐ Bad ☐

Figure 7-1.

Reverse side Figure 7-1.

ELECTRICAL (continued)

CONVENIENCE OUTLETS
Type: ____

TRANSFORMER CAPACITY
Type: ____
Location: ____

PANEL
Type: ____
Location: ____

ELECTRICAL DEVICES
____

MECHANICAL

DOMESTIC WATER
CW Pipe size ____________ Type ____________
HW Pipe size ____________ Type ____________

HEATING
Type: Steam ☐ Hot Water ☐ Forced Air ☐
Gas ☐
Radiators ☐ Convectors ☐ Fan Coil Units ☐

VENTILATION
Type: ____

AIR CONDITIONING
System
Type: DX ☐ Chilled Water ☐ Window Units ☐
Type of installation: ______________________________
Capacity: ____

LABORATORY UTILITIES
Type: Gas ☐ Dist Water ☐ Compressed Air ☐
Vacuum ☐

FURNITURE

Type: Office ☐ Classroom ☐ Laboratory ☐
Recreation ☐ Dormitory ☐

MAJOR REPAIRS, RENOVATIONS AND ALTERATIONS
COMBINED REQUEST AND ESTIMATE FORM FOR TYPICAL PROJECT

This side to be filled in by requesting department and forwarded to Director of Physical Plant.

Date ____________________

Requested by: ______________
Bldg. & Room: ________

Department: ______________
Name of person to contact: ______________
Telephone extension: ________

IF THIS REQUEST IS FROM ACADEMIC UNIT, COMPLETE THIS SIDE ONLY. Recommended by:	IF THIS REQUEST IS FROM ADMINISTRATIVE UNIT, COMPLETE THIS SIDE ONLY. Recommended by:
______________ Department Chairman	______________ Administrative Unit Head
______________ Dean	______________ Department Director

DESCRIPTION OF WORK OR SERVICE:
____
____
____

Academic/Administrative schedule will permit work to be started when? ______________
When should work be completed? ______________
Is sketch or plan available? ______________
Is space assignment affected? ______________

JUSTIFICATION: Why is this request necessary? (Use additional sheet if necessary.) ______________
____
____
____
____

1st COPY - ORIGINAL to Physical Plant
2nd COPY - to Space Authority
3rd COPY - to Funding Authority
4th COPY - File copy

Figure 7-2. Combined Request and Estimate Form
(a one-sheet form, front and back)

Reverse side Figure 7-2.

THIS SIDE FOR USE OF DIRECTOR OF PHYSICAL PLANT ONLY

Date ____________________

TO: Requesting Department
FROM: Office of the Physical Plant

Your Project Request has been received and a Physical Plant Project No. has been assigned to this request as shown in the estimate portion below. If you have any questions concerning this project, please refer to this project number.

This project has been approved and scheduled to start ______________, and the estimated date of completion is ____________________.

This project cannot be completed because ____________________

____

Office of the Physical Plant - by ____________________

____

PHYSICAL PLANT PROJECT NUMBER _____

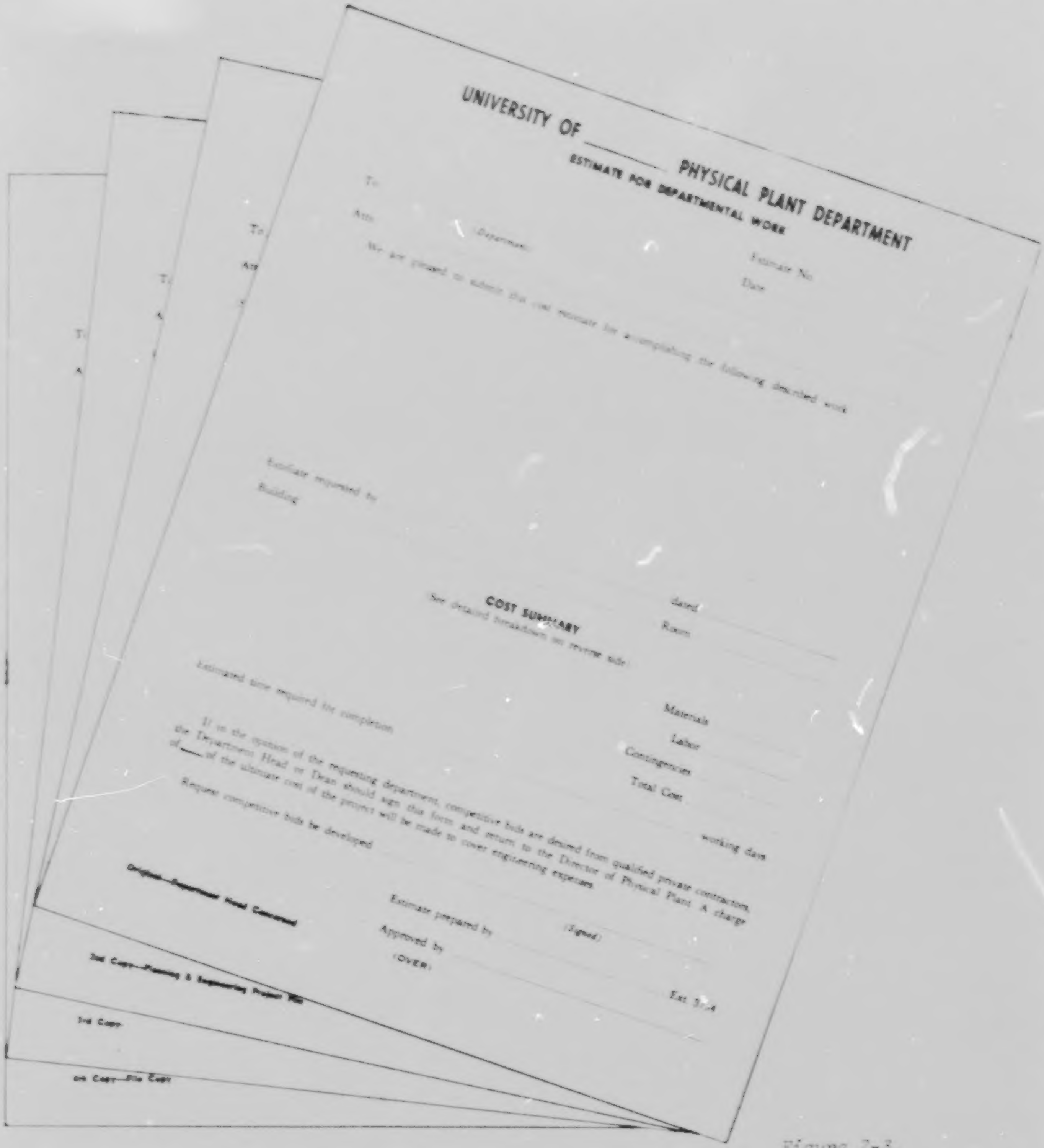
COST ESTIMATE

	Labor	Materials
STRUCTURAL:		
Carpentry....................	$______	$______
Masonry......................	______	______
Demolition & Cleanup.........	______	______
MECHANICAL:		
Air Conditioning.............	______	______
Heating......................	______	______
Plumbing.....................	______	______
ELECTRICAL:		
Electrical...................	______	______
FINISHES:		
Painting.....................	______	______
Plastering...................	______	______
Acoustical...................	______	______
Hardware.....................	______	______
OTHER:		
__________________...	______	______
CONTRACT:		
Outside Contract.............	______	______

SUMMARY

LABOR COST..	$______
MATERIAL COST.......................................	______
TOTAL COSTS	$______

Approvals:
Space Authorization ____________________
Funding Authorization ____________________
Physical Plant Director ____________________



UNIVERSITY OF ______ PHYSICAL PLANT DEPARTMENT

ESTIMATE FOR DEPARTMENTAL WORK

To:

Attn: (Department)

Estimate No.

Date

We are pleased to submit this cost estimate for accomplishing the following described work

Estimate requested by

Building

dated

Room

COST SUMMARY

(See detailed breakdown on reverse side)

Materials

Labor

Contingencies

Total Cost

Estimated time required for completion working days

If in the opinion of the requesting department, competitive bids are desired from qualified private contractors, the Department Head or Dean should sign this form and return to the Director of Physical Plant. A charge of ___ of the ultimate cost of the project will be made to cover engineering expenses.

Request competitive bids be developed

Estimate prepared by

(Signed)

Approved by

(OVER)

Est. 3/4

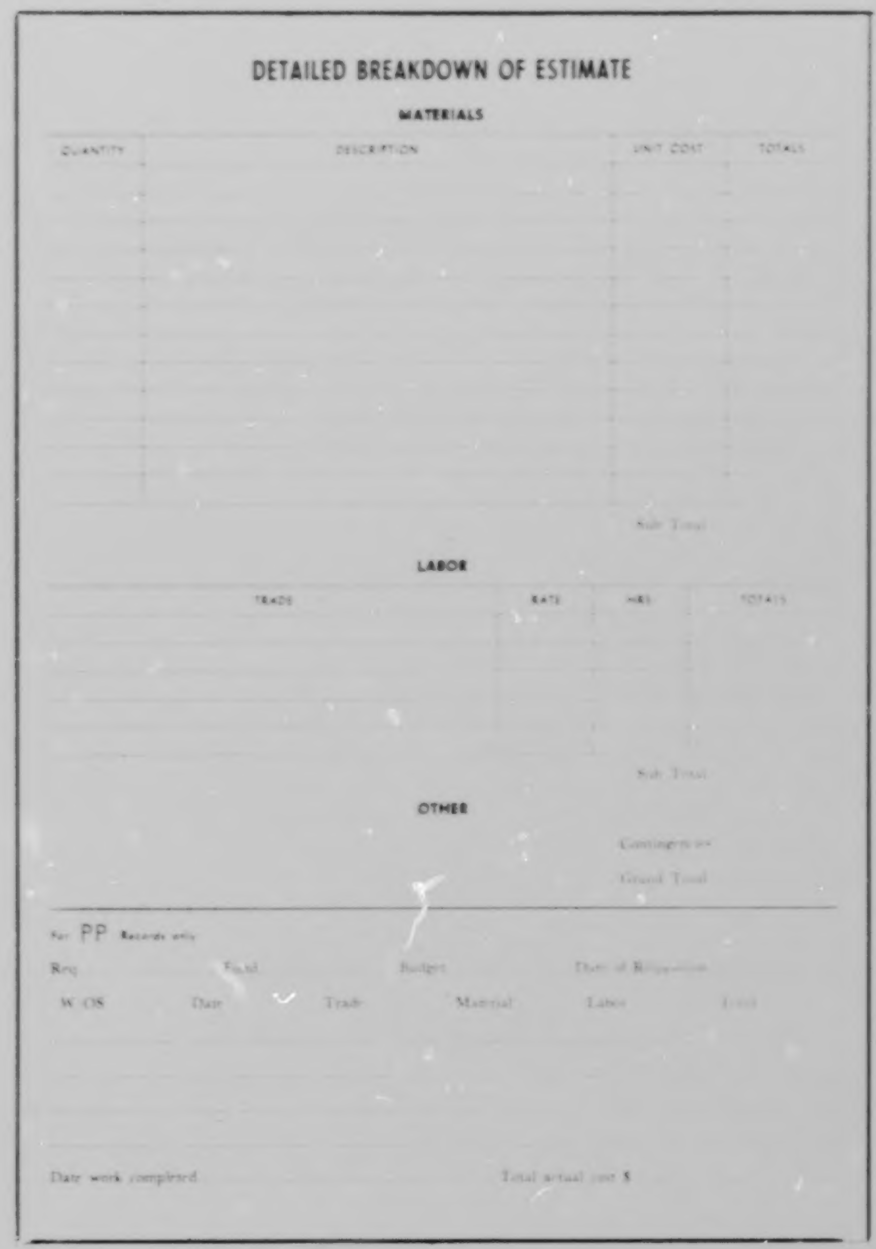
Original—Department Head Concerned

2nd Copy—Planning & Engineering Project File

3rd Copy

4th Copy—File Copy

Figure 7-3.



DETAILED BREAKDOWN OF ESTIMATE

MATERIALS

QUANTITY	DESCRIPTION	UNIT COST	TOTALS

Sub Total

LABOR

TRADE	RATE	HRS	TOTALS

Sub Total

OTHER

Contingencies

Grand Total

For PP Records only

Req Fund Budget Date of Requisition

W OS	Date	Trade	Material	Labor	Total

Date work completed

Total actual cost $

Reverse side Figure 7-3.

Decisions

Physical plant planners can feel free because they do not take the last step: they do not make the final decision. They submit their estimates and recommendations, along with any remaining objections from the asking department, but the planning committee reviews their work and decides to abandon or proceed with the project. In many schools, other officials, such as deans and the president, may also have authority to concur with or cancel the committee's decision. The point to reemphasize is that the physical plant department only advises and implements.

THE DESIGN PHASE

IN-HOUSE VERSUS PRIVATE DESIGN

When the physical plant department submits the results of its feasibility study, it also recommends whether the school should design the project through its in-house staff or whether it should employ private architects and engineers. The preferable option hinges on the cost, complexity, capabilities and regular workload of the department planning staff, and on the availability and competence of local professionals.

Outside help obviously costs more, but is often the only answer. If the staff can barely keep up with ongoing work, then the decision is clear. If the work could be scheduled during slack times, however, staff design would be preferable, since this would keep the costs down and allow more money for quality construction.

Complexity is harder to judge. Since staff planners have to be "generalists" who can supervise a wide variety of architectural and engineering projects, they may not have the specialized knowledge required for a complicated renovation. One key can be the staff's need for private consultants during the feasibility study. If they required this help, then a professional design team might be the answer. Although outside experts cost more, they can often avoid expensive mistakes that nonspecialists might commit.

The same procedures that apply to hiring and supervising professionals for new construction should be followed for renovations and alterations. These details are discussed fully in the chapter, Physical Planning, Design and Construction. It is worth emphasizing here that the school should clarify in writing exactly what services will be provided, and that the parties should agree in advance on either the amount of remuneration or the method for determining it. Usually the design team will provide schematic designs, conceptual reviews, working drawings, final cost estimates, specifications for the bidding document, and supervision of the actual construction work. Designers usually charge a higher percentage for these services on a renovation or alteration; often it can run as high as 10% of the total cost.

Should a physical plant department take on the design job, the staff planner should take special care in preparing the specifications. One of the best guides to consult is the MANUAL OF PRACTICE, a handbook published by the Construction Specifications Institute, Inc. It describes and rates five methods for writing specifications, any or all of which may be needed on a particular job.

1. Descriptive Specifications. These list in detail the exact characteristics wanted in the product.
2. Proprietary Specifications. This method allows the school to set quality levels by requiring brand-name products.
3. Reference Standards. This method stipulates that the material or equipment meet quality levels established and published by authorities in the field.
4. Performance Specifications. Instead of listing the material characteristics, this technique requires that the product accomplish certain functions.
5. Cash Allowances. A tactical maneuver, this provision allows the planners to begin bidding and complete a contract while delaying a particular specification decision.

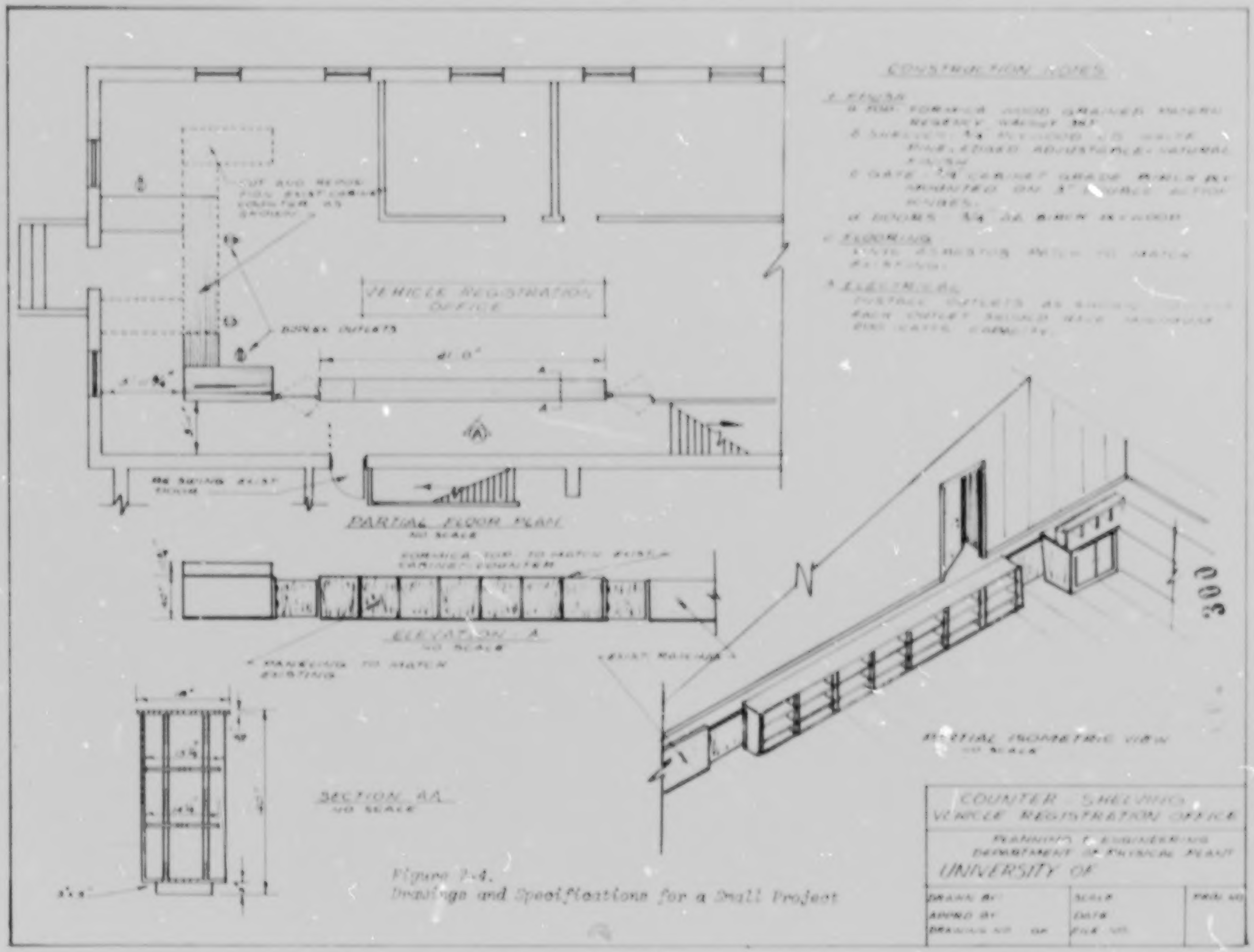
Whether prepared by the planning staff or by a professional design team, accurate written specifications are important to the success of any project, especially if the school chooses to hire a private contractor. He operates primarily for profit and is only obligated to provide the materials and workmanship that the school asks for in writing; without careful supervision, he may provide less. See for an example of drawings and specifications for a small project, Figure 7-4.

THE CONSTRUCTION PHASE

Private contractors and in-house construction are discussed under separate headings, and many schools find it practical and economical to combine the two methods on certain projects. Such is the case on renovations and alterations for which the in-house trades staff can handle part of, but not all, the work. By asking reliable local subcontractors to take the remaining portions, the school saves considerable expense (including the general contractor's overhead and profit percentage) and still acquires the skilled labor necessary to complete the job. To save more time and money, the physical plant director at a private school can first try to negotiate a reasonable contract with a reliable firm before advertising for public bids. The success of this variant depends in part on the director's knowledge of, and friendly relations with, private contractors and tradesmen in his area.

For many public institutions state laws require the physical plant department to advertise for bids on projects beyond a certain magnitude, for example, on projects estimated at more than $2,500.00. In some cases, state laws set specific limits on how large a project the physical plant department may undertake. For example, in the State of Washington, physical plant departments at state institutions may not attempt projects estimated at more than $10,000.00. At both public and private institutions, flexibility is the key to successful management of such unusual projects.

300


CUT AND REMOVE EXIST. CABINET COUNTER AS SHOWN
VEHICLE REGISTRATION OFFICE
DUPLEX OUTLETS
41'-0"
A
RE SWING EXIST. DOOR
PARTIAL FLOOR PLAN
NO SCALE
FORMICA TOP TO MATCH EXIST'G CABINET COUNTER
ELEVATION A
NO SCALE
PANELING TO MATCH EXISTING
EXIST. RAILING
SECTION AA
NO SCALE
PARTIAL ISOMETRIC VIEW
NO SCALE

CONSTRUCTION NOTES

1. FINISH
   - a. TOP: FORMICA WOOD GRAINED PATTERN REGENCY WALNUT 367
   - b. SHELVES: 3/4" PLYWOOD A/B WHITE PINE, EDGED ADJUSTABLE, NATURAL FINISH
   - c. GATE: 3/4" CABINET GRADE BIRCH PLY MOUNTED ON 3" DOUBLE ACTION HINGES.
   - d. DOORS: 3/4" SL BIRCH PLYWOOD
2. FLOORING
   VINYL ASBESTOS PATCH TO MATCH EXISTING.
3. ELECTRICAL
   DUPLEX OUTLETS AS SHOWN. [illegible] EACH OUTLET SHOULD HAVE ADEQUATE [illegible] CAPACITY.

COUNTER – SHELVING
VEHICLE REGISTRATION OFFICE

PLANNING & ENGINEERING
DEPARTMENT OF PHYSICAL PLANT
UNIVERSITY OF

DRAWN BY
APP'D BY
DRAWING NO. OF
SCALE
DATE
FILE NO.
PROJ. NO.

Figure 7-4.
Drawings and Specifications for a Small Project

Figure 7-5.

SAMPLE OF INITIATION AND COORDINATION INSTRUCTIONS FOR A MINOR ALTERATION OR IMPROVEMENT

August 15, 19___

MEMORANDUM TO: Warehouse Clerk
Carpenter Foreman
Electrical Foreman
Paint Foreman
Work Control Desk

FROM: Director of Physical Plant

SUBJECT: ALTERATIONS AND RENOVATIONS MOTOR VEHICLE REGISTRATION OFFICE

1. Approval has been received from the Business Office to proceed with the alterations shown on the drawings. (Refer to Figure 7-4.)

2. We will use our own "in-house" personnel on overtime and the entire cost will be reimbursed to Physical Plant.

3. The work must be accomplished prior to registration on September 19, 19 ___.

4. Coordination of work must be arranged to permit the office to continue in operation.

5. When construction work is completed, the entire area is to be repainted with one coat of same color.

6. Responsibility for all phases of the project are under the Carpenter Foreman.

7. A meeting will be held at 8:00 a.m., August 18, 19___, of all parties in receipt of this memo at the job site to resolve any unanswered questions. We must cooperate and insure completion by the deadline.

PRIVATE CONTRACTORS

The major advantages of employing an outside contractor for the construction work are similar to those mentioned in the discussion of design. Some projects may be so large that the department cannot tackle and complete them within the time available without disrupting routine maintenance. Some may require specialized equipment or skills that are not available in-house. Examples are jobs requiring considerable welding, sophisticated electronics, and heavy refrigeration. The primary disadvantages are the higher costs entailed and the difficulty and cost of instituting changes once construction has begun.

For detailed information on how to arrange bidding procedures, and how to negotiate and administer different types of contracts. consult the appropriate sections of Chapter 9, Physical Planning, Design and Construction. For renovation and alteration projects, as well as for new buildings, the physical plant department should maintain a list of reliable contractors and invite at least three to bid on each job. Since these projects are not as large or as complicated as new buildings, the department can effectively utilize smaller companies who have the capacity to handle major renovations and alterations but lack the bonding rating for new construction.

A written contract based on the specifications is necessary for any work done by outside firms. It should describe the scope, quality of materials and workmanship, and the sequence to be followed. As with an architectural contract, it should also specify the cost or method for determining, it. Many small jobs are done on a "time and materials" basis, but the contract should state whether this includes fringe benefits, such as insurance, administrative overhead, and a profit margin. All contract work must be carefully negotiated and supervised, but special care is needed on "time and material" agreements that contain no incentive to finish within budget and time limits.

IN-HOUSE METHODS

Preparation of specifications becomes less important if the physical plant department decides to administer the project itself. It is still necessary to write down exactly the level of quality the school desires in labor, materials and equipment, but with an in-house operation, any mistakes can be rectified without recourse to lawsuits. In addition, there are other advantages to setting up in-house renovations and alterations. Obviously, the cost will be considerably less if staff labor can handle the job, and changes to the project will be easier and less expensive to initiate as the job progresses. Since many maintenance men find this kind of project more exciting than their routine assignments, departmental morale may improve.

A few important warnings should be noted, however. One of these was stressed earlier: major repairs, renovations and alterations are not routine maintenance, and the use of departmental personnel should be funded, therefore, from special sources and not from the maintenance account. Since normal work must proceed according to schedule, an in-house operation may require considerable overtime, weekend and holiday work. At most schools, administrators expect certain slack periods and are ready to reassign some maintenance personnel to major projects during these periods. A well-organized department, however, will have accounted for most of the work time of its personnel throughout the year.

On an in-house repair, renovation or alteration, the physical plant department can try some of the tricks that have proved practical on new construction. The first is to place one staff member in charge of the total project. In small schools, this may be the director, but on a complex job he may want to assign this work to someone else. And with good reason--supervision of a large renovation or alteration could be one man's full-time responsibility. The project supervisor utilizes other in-house tradesmen for certain portions of the job, synchronizes their efforts, inspects their results and keeps communications flowing quickly through proper channels. His multifarious duties could include arranging for interruption of utilities and, in general, scheduling all work so that it disrupts campus life as little as possible. More importantly, he insures that all code requirements are met and that careful records are kept for each stage and for the total project.

Another effective practice is the preconstruction conference. At an onsite meeting the coordinator helps the major suppliers and participants visualize all the inherent difficulties, announces any deadlines, and clarifies and synchronizes the important phases of the work. To best utilize the time at such a meeting, he should send out beforehand, a checklist of the significant topics to be discussed. Afterwards he should compile and distribute a written record of all decisions reached. By thus reviewing with these men the scope and timing of the work, the coordinator can uncover and remove lingering doubts and confusions that might, if undetected, later cause the mix-ups that leave workmen standing around doing nothing but draining the budget. Figure 7-5 is an example of an initiation conference with its coordinating instructions.

Since communication is so important, it deserves special mention here. Once the director or his appointed representative has coordinated the work to be done and has explained the lines of authority to be followed, he should keep each member of the construction team informed of the progress and problems encountered by the others. His primary purpose at this stage is to minimize loss of time and money. If he can spot delays in the framing work, for example, he can then reschedule the plumbers and electricians for other work. He can also capitalize on the goodwill that attends any improvement by informing the using department of the progress of their project.

As mentioned earlier, the coordinator can also bring in qualified authorities to perform final inspections and insure that all safety, sanitation, health and building codes have been met. At the same time he should prepare as-built drawings to provide the department with an accurate record that incorporates all changes from the original plans. For plumbing and wiring work, he might photograph all conduits before they are enclosed. Such records will be important if any problems have to be repaired or if additional renovations and alterations are later attempted on the building.

THE POST-CONSTRUCTION PHASE

When the last subcontractor or staff tradesman has finished, the project coordinator and the physical plant director should accompany representatives from the using department on a tour of the facility. In the case of contract work, the school officials double-check for complete compliance with the specifications. In the case of in-house work, they inspect to insure that the work was done properly. If any deficiencies remain, they should be rectified before occupancy lest unnecessary and expensive maintenance problems emerge in the future.

With the approval of the asking department, the physical plant department can then take final acceptance of the project and release final payments to contractors and suppliers.

The concluding step is an after-action report by the project coordinator. This document should summarize the purposes of the project, evaluate the methods to accomplish them, and, most importantly, tabulate the costs involved. Such reports provide useful information for estimating costs of future projects; they also help pedagogues and planners learn from their mistakes and, hopefully, from their successes.

8

SECURITY and SAFETY

INTRODUCTION... 313-315

SECURITY... 316-344
Figure 8-1 : Typical Organization Chart for a Security and Safety Force at a Small School
Figure 8-2 : Sample Officer's Daily Log
Figure 8-3 : Sample Complaint Report
Figure 8-4 : Sample Arrest Report
Figure 8-5 : Sample Identification Record
Figure 8-6 : Sample Property Report
Figure 8-7 : Sample Vehicle Registration Form

SAFETY... 345-372
Figure 8-8 : Sample Property or Content Damage Report
Figure 8-9 : Sample Accident Report
Figure 8-10: Workmen's Compensation Form

APPENDICES:
8-A FACTS SHEET ON PORTABLE FIRE EXTINGUISHERS.... 366-367
8-B OSHA VIOLATIONS CHECKLISTS.................... 368-372

8

SECURITY and SAFETY

THIS CHAPTER ON SECURITY AND SAFETY must be an awkward hybrid covering two related services frequently assigned to one division for expeditious reasons. For several reasons, both services began to command a larger slice of the instituional dollar during the last decade.

Security forces grew because of the rise in urban crime. On many campuses the number of security personnel per student doubled, and on a few it nearly tripled.

Safety programs also accelerated, but at a far less dramatic rate and for different reasons. The prime mover in this case was the federal government. Spurred by the rising accident rate in the construction industry and in institutional work, Congress in 1970 passed landmark legislation that forced all large employers to initiate or improve procedures for occupational safety and health. Called OSHA, the Occupational Safety and Health Act inevitably generated further improvements in related programs for fire and traffic safety.

On many campuses the impetus generated by sudden expansion carried the security force beyond the bailiwick of the physical plant department--its traditional home. Safety, often a part-time function of the security director, also left physical plant jurisdiction. A 1968 poll of one hundred eighty-five colleges and universities showed only forty-nine security directors reporting to a physical plant director. Fifty-three reported to vice presidents, twenty-seven to business managers, nineteen to various deans, and twelve to presidents. The educated guess is that this trend will continue, especially at rapidly expanding schools and those located near, or in urban areas. For many small schools, however, security and safety remains an adjunct of the physical plant department.

This chapter neither explores nor resolves the issues. It does provide the responsibility for these two services.

SECURITY

The security force on most campuses grew out of night watchman service, and the night watchman service grew out of insurance company requirements for some kind of fire watch patrol. The watchman's job was relatively simple: he locked or unlocked doors, closed windows, turned off lights and water fountains, looked for fire, sniffed for smoke, and perhaps checked equipment and furniture for theft or vandalism. School property was his main concern, and the physical plant department, his natural home. Most institutions small and large have either replaced or supplemented the watchman by personnel with broader responsibilities and powers.

Protecting life and property and preserving the peace, according to traditional definitions, are the primary missions of the campus security force, and most of its functions derive from that concept. This division, like any city or state police department, must:

Prevent crime
Enforce state and city ordinances
Patrol the area of responsibility
Preserve and collect evidence
Conduct investigations
Arrest offenders
Prepare prosecution cases for court
Regulate crowds, traffic and other noncriminal activities
Operate a radio communications system
Train recruits
Cooperate with other law enforcement agencies

In addition, a campus security force carries other responsibilities; in most cases it also must:

1. Enforce school policies and regulations in addition to civil laws.

2. Administer parking.

3. Serve an important public relations function.

ORGANIZATION AND STAFFING

Of good men and sufficient money--two keys to success--the first is probably the most important for a security program. An incompetent director can squander lavish funding and inadequate personnel can disturb the peace as often as they keep it. The most important man is the director; he should have at least ten years experience in police work, investigations, and administration.

He may come from county, state, or military police, and he should come equipped with an interest in, and an open mind about, the problems of young people. This factor can be as pertinent as his experience.

The rest of the staff could be deputized law enforcement officers or a combination of watchmen, guards, and part-time students. Workmen from other branches of the physical plant department can serve as watchmen. Security guards can also conduct organized patrols, file reports and wear identifying uniforms. Law enforcement officers would also be uniformed and armed with arrest powers and probably with weapons.

One of the first problems the security director must solve is staffing. How many men are needed? Where are they found? What should the labor budget be? Answers for these questions are never final ones; they come up for reexamination every year at budget time. Unfortunately, such basic problems have received little systematic study, which means the director has only "rules of thumb" and general advice to guide him. Traditional approaches to staffing are:

1. The first and most effective method requires a thorough survey of the plan, policies, operating procedures and campus population. Such a survey can be time-consuming to compile, and because it incorporates many judgments based on intuition, experience and guesswork, it can also be inaccurate.

2. Quicker, but less accurate, is the "rule of thumb" method that assigns one man on duty for every 1,000 full-time equivalent population. This estimate cannot account, however for unique conditions found on different campuses and for

> varying functions assigned to different security departments. For example, a 1-per-1,000 ratio does not provide personnel for the administration of the parking program, a job handled on many campuses by the security force. With its obvious flaws, however, this method can still give the new director a staff, an initial staff number to start with, a number he can later refine as he becomes more familiar with the special needs of his campus.

After using one of these methods to estimate the number of man-years the department needs, the director must calculate the minimum staffing needs for twenty-four-hour coverage by the following steps:

1. From 2,080 hours (40 hours x 52 weeks) subtract approximately 240 hours for paid holidays, vacations and sick leaves. The number of hours spent on the job comes to 1,840.

2. Divide this number of hours on the job into 8,640, the number of hours in a 365-day year. 8,640 divided by 1,840 equals 4.7.

The result shows 5 to be the minimum number of men needed for daily, round-the-clock patrol for the entire year.

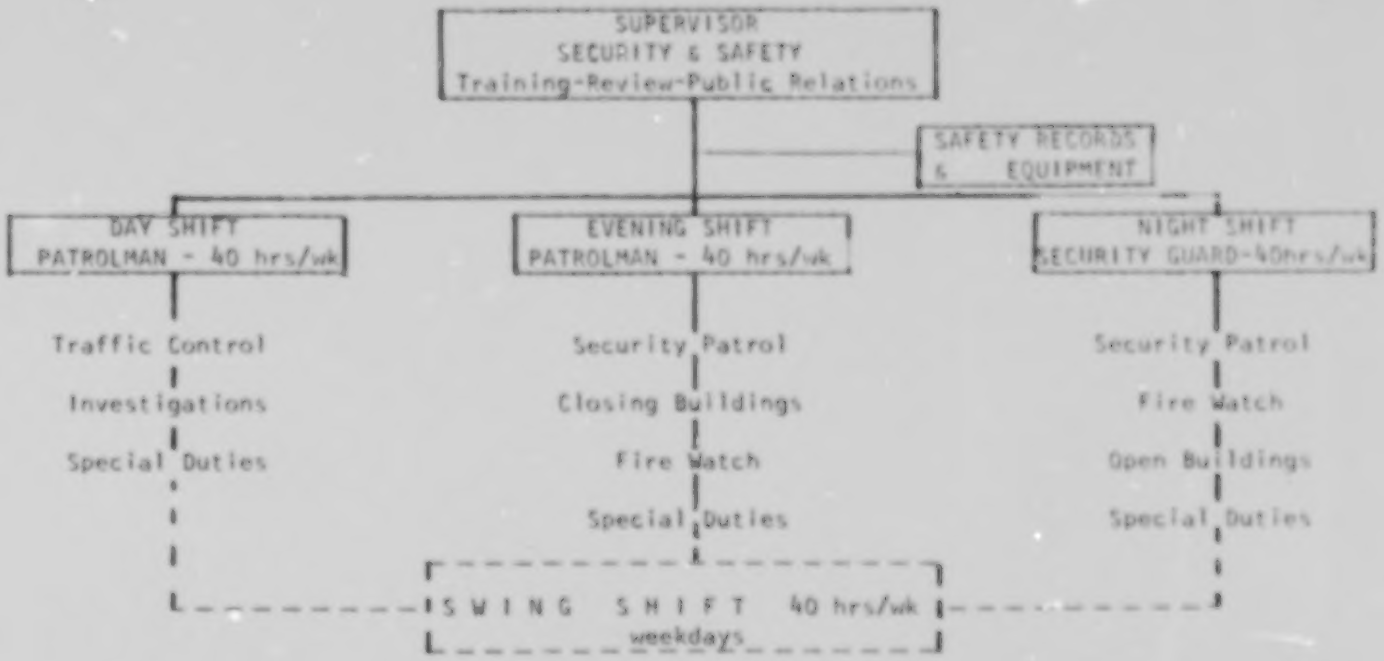
Even at a very small school, therefore, the security division should begin with at least 5 men and a director. Due to his workload of administrative, supervisory, liaison and public relations tasks, the director should always have at least 1 man on duty in addition to himself to handle routine and emergency jobs. A five-man crew also provides one person to fill any abnormal absence such as training leave. For work this skeleton crew cannot handle adequately, the director can later request additional staff positions. As a matter of policy, however, heavy overtime loads should be avoided to enable personnel to continue the training that will further professionalize the division. Figure 8-1 shows a typical organization chart for a security and safety force at a small school.

The type of security division varies with campus conditions. In many cases, watchmen and security guards handle most routine assignments. Every department, however, should have on duty or on call from local agencies officers with law enforcement powers. When the volume justifies it and the budget allows it, the division should hire or train one full-time investigator.

SAMPLE ORGANIZATION CHART

SECURITY AND SAFETY DEPARTMENT
For Small University or College

Minimual staffing to provide twenty-four hour coverage - 6 employees


SUPERVISOR
SECURITY & SAFETY
Training-Review-Public Relations
SAFETY RECORDS & EQUIPMENT
DAY SHIFT
PATROLMAN - 40 hrs/wk
EVENING SHIFT
PATROLMAN - 40 hrs/wk
NIGHT SHIFT
SECURITY GUARD-40hrs/wk
Traffic Control
Investigations
Special Duties
Security Patrol
Closing Buildings
Fire Watch
Special Duties
Security Patrol
Fire Watch
Open Buildings
Special Duties
SWING SHIFT 40 hrs/wk
weekdays

The Supervisor and Safety employee will have part-time shift duties

since minimum of FIVE employees are required to provide continuous twenty-four hour coverage.

Part-time student employees are widely used.

Figure 8-1.

Not all personnel need be full-time staff. Many security forces employ students part-time to handle routine work. Writing parking tickets, for example, is one assignment that does not require a professional officer. After a short period of on-the-job training, students can also handle many basic watch and patrol duties. Economy and efficiency are the major advantages of part-time help. Students usually work for approximately half the rate officers receive, and they release trained men to concentrate on work requiring greater expertise. The only disadvantage comes when a student patroller encounters an emergency or a criminal act in progress. To provide for these situations, the department, as mentioned earlier, should have on duty an officer whom the student can summon.

RECRUITMENT AND TRAINING

Finding good personnel to man a security force takes time and effort. Good places to look are county, state and military police departments, but the best place is another college security organization. From these agencies may come excellent prospects who fall barely short of some less important requisite such as necessary height or uncorrected vision.

From whatever source, the director must carefully screen all applicants to weed out ill-suited rejects looking for an easy job, incipient dictators looking for power to wield and timid types unable to exercise authority. Since psychological tendencies such as these may manifest themselves only in on-the-job situations, a probation period with close supervision is essential.

Also essential is a minimum educational requirement. Often this is a high school diploma, but many schools now look for a junior college associate in police science, and some larger universities aim for a bachelors degree or aptitude and willingness to work toward this degree.

Additional advice on choosing candidates comes from Paul Steuer, security director at the University of Cincinnati. Although he obviously had men in mind when he prepared this list of prerequisites, most of his suggestions also help in evaluating women candidates, who are now applying for security work in increasing numbers.

1. Age. Set parameters such as 21 to 50 that do not exclude able retired persons. Beware of retirees, however, who are looking for a plum, a job that will give them good money for depositing all their dead weight on their dead posteriors. Look carefully for an active, capable policeman.

2. Training. The candidate obtained should have a police commission or have satisfactorily completed an approved training course.

3. Physical Requirements. The candidate should stand 5'8", possess a reasonably proportionate physique and a clear speaking voice. A person with a physical or speech defect would be subject to ridicule and harassment, which could compound verbal abuse prevalent in current confrontations.

4. Capabilities. The prospect must be able to accept and follow orders, analyze unexpected situations and work cooly in emergencies involving danger, massive injuries, pain and even fatalities.

5. Flexibility. The candidate must be willing to work day or night shifts, weekends, holidays and in all kinds of weather.

For the final selection, Steuer suggests a tough oral interview in which the director probes persistently for temperament, alertness, composure, attitudes and prejudices.

With pay scales for campus security work usually falling well below city, county and state salaries, it is the rare applicant who comes to campus fully trained. Most security directors try to find good prospects, and then struggle to train them. To do the job properly, the division should set up a two pronged program to insure on-the-job training in the company of an experienced officer and classroom coverage of basic elements of law enforcement.

The classroom sessions should cover most, if not all, of the topics listed on the following pages. This typical curriculum outline was prepared by Edward T. Kassinger, director of public safety at the University of Georgia.

A SUGGESTED CURRICULUM GUIDE

1. ORIENTATION PROGRAMS
   - a. Law enforcement philosophy
   - b. Proper notetaking
   - c. University rules, regulations and policies as they affect campus law enforcement
   - d. Campus law enforcement; rules and regulations

2. COMMUNITY RELATIONS
   - a. Personal appearance conduct and etiquette
   - b. Law enforcement relationships with
     - ...Student body (including discussion of student government; identification of student leaders for purposes of better rapport)
     - ...Administrators (identification of administrators; responsibilities and general indoctrination with regard to administrative organization and responsibilities of various departments of the administration)
     - ...Faculty (identification of leading academic personnel; responsibilities, proper manner of contact, etc.)
     - ...Alumni (university concern with alumni relations, etc.)
     - ...General public
     - ...Other law enforcement agencies including federal, state, county, and municipal

3. CRIMINAL LAW AND RELATED SUBJECTS
   - a. Criminal law
     - ...Laws of arrest
     - ...Searches and seizures
     - ...General constitutional requirements with regard to due process and legal warnings
     - ...Laws of evidence
     - ...Laws relative to search for concealed weapons
   - b. Discussion of civil rights
   - c. Administration of criminal law

4. CRIMINAL INVESTIGATIONS
   - a. Proper method of recording complaints regarding alleged criminal acts
   - b. Report writing
   - c. Assaults
   - d. Automobile thefts
   - e. Burglary
   - f. Collection of evidence
   - g. Injury and death investigations
   - h. Interviews and interrogations
   - i. Robbery
   - j. Sex crimes
   - k. Larceny and stolen property
   - l. Scientific aids
   - m. Fingerprint evidence
   - n. Vice investigations
   - o. Drug abuse
   - p. Forgeries

A SUGGESTED CURRICULUM GUIDE (continued)

5. *PATROL PROCEDURES*
    - a. *Foot and motorized patrol in crime prevention and detection*
    - b. *Arrest and control of vehicle occupants*
    - c. *Proper manner of handling disturbance and felony-in-progress calls*
    - d. *Recognition and handling of abnormal persons*
    - e. *Driving under the influence cases*
    - f. *Field notetaking and crime scene recording*
    - g. *Crime scene procedure*

6. *TRAFFIC CONTROL*
    - a. *Traffic direction techniques*
    - b. *Citations for violations of traffic ordinances*
    - c. *Traffic laws applicable to campus*
    - d. *Accident reporting*
    - e. *Accident investigation*
    - f. *Motor vehicle inspection law*
    - g. *Hit and run investigations, including gathering of evidence in such cases*

7. *COURT PROCEDURE*
    - a. *Court room demeanor*
    - b. *Simple rules of evidence and testifying in court*

8. *JUVENILE PROCEDURES*

9. *DEFENSIVE TACTICS*
    - a. *Arrest techniques*
    - b. *Defensive techniques*

10. *PERSONAL SKILLS AND SPECIALIZED TRAINING*
    - a. *Firearms training*
    - b. *Proper use of auxiliary equipment including handcuffs and other restraining devices or protective equipment*
    - c. *Crowd control*
    - d. *Fire prevention and control*
        - *...Campus*
        - *...Buildings*
        - *...Automobiles*
    - e. *First aid*
    - f. *Social problems in the campus community*

Such training is only the basic program, the beginning. After the officer masters the fundamentals of his job and proves his value to the division, he will need further training. If the director has a good working relationship with state or county agencies, he might place the exceptional prospect in one of their programs to learn specialized skills in critical jobs such as investigation and crowd control.

Another option is additional on-campus training for in-service promotion. Such a program might cover topics such as:

1. Role of law enforcement.
2. Laws of arrest, search, seizure (civil rights, civil liberties, and constitutional guarantees).
3. Criminal law.
4. Vehicle and traffic laws and traffic control methods and techniques.
5. Rules of evidence, court procedure and testimony.
6. Interview or interrogation principles and techniques--admissions, statements, crime scene notations.
7. Civil complaints.
8. Crowd control; confrontation; management.
9. Patrol function--duties and techniques.
10. Techniques and mechanics of arrest.
11. Juvenile methods; procedures.
12. Reporting and report writing.
13. First aid.
14. Tactical operations.
15. Investigation techniques.
    a. Homicide, assault
    b. Burglary
    c. Larceny
    d. Vice control
    e. Undercover
    f. Narcotic

POLICIES

The campus security force handles special problems not faced by most municipal police departments. It must enforce institutional policies as well as civil laws, extend special treatment to students and conduct confidential investigations. To simplify a complex assignment, the security director should ask his superior administrators to formulate clear policy statements on the following controversial issues:

1. Student Offenses. Most colleges and universities prefer to handle minor offenses internally in order to save the student from a police record that could harm his career prospects. Without question, felonies should always go to civil court, but considerable ambiguity remains about what constitutes a "minor" offense. If administrators do not establish an institutional policy on this issue, it will be the on-duty officer who decides whether a student sees the dean of students or the local judge.

   In many cases, the student suspect will be reported not to a dean of students but to a court of students. With the recent disappearance of *in loco parentis*, many schools have student judicial boards try students accused of violating institutional policies and minor civil statutes. While this trial by peers for campus crimes is logically consistent with due process as practiced in civil courts, the concept of special treatment for civil offenses, some security officers argue, is not consistent with student demands for adult privileges.

2. Institutional Policies. How much force is the campus officer expected to exert in order to enforce school policies not supported by civil law? Campus demonstrations, in partitular, often have presented ambiguous decision situations for security police.

   Which school policies are to be rigorously enforced and which loosely enforced? Ideally, all police should apply all laws equally, but administrators, like legislators, often establish paper policies that are difficult to enforce in concrete situations because of prevailing customs. Prohibition against liquor was one famous example of this dilemma, and the current prohibition against marijuana is a more pertinent example. Although most states and schools have laws about its use, the wide variety of civil penalties have resulted in an unofficial "hands-off" policy at some schools and only sporadic enforcement at others, especially in view of the widespread use of marijuana.

3. Weapons. Whether the security force should be armed is always a debatable question. Police traditionally ask for weapons and students traditionally protest their presence. On this issue the director should plead his case, not in terms of an absolute right to bear arms, but in terms of the kinds of crime and criminals his officers are likely to encounter. If he wins the argument he must provide sufficient training for his officers to insure that a weapon is never used except in self-defense.

4. Off-Campus Police. Who has authority to call in an off-campus police force can also become a disputed issue. Under extraordinary conditions, such as a riot or natural disaster, the security director may wish to summon additional help. Because the director thinks he can best judge need, he usually is the appropriate authority. Because students and faculty react so strongly to invasion, many principal administrators prefer to retain this authority.

   Under normal operating conditions, outside police come onto a campus only after receiving permission from the campus force. If city or state agencies wish to interrogate, investigate or arrest a student, teacher or staff member, the campus force usually apprehends the suspect and turns him over. Since school officers are more familiar with institutional routines, they can manage the job with less disturbance.

PROCEDURES

After administrative policy has been established on the above questions, the director can concentrate on his job: establishing effective procedures to protect life and property and preserve peace.

Patrols

Good patrols are the backbone of an effective security operation. The simplest consist of a watchman who makes rounds to check doors, windows and equipment and calls in assistance for other problems. The sophisticated patrol consists of a fully armed and trained officer who professionally checks the premises, investigates the unusual, takes whatever action is appropriate, and files follow-up reports. This kind of patrol is essential to protecting property, detecting crime, managing emergencies, and supplying information. It also lowers insurance premiums.

Organizing patrols is one of the director's major administrative tasks. To provide proper coverage twenty-four hours a day, he must first analyze the campus living and working patterns to identify recurring security needs. Heaviest patrols usually occur during the evening and midnight shifts. The evening shift often includes cash escort, general lock-up, special events service, and general security tours. The midnight shift consists primarily of touring the campus and unlocking buildings for the next day's work.

The only way a director can develop a realistic patrol routine for his campus is by making a rough time and motion measurement of the tasks to be performed and areas to be covered. When the campus proves too large for one man to cover adequately "with spare time for emergency work, the director should set up two or more patrol beats covering approximately equal floor areas of buildings under surveillance.

Patrol patterns should be varied periodically to foil planned thefts and to develop versatile personnel.

If possible, the patrolman should report his whereabouts periodically to the shift supervisor or officer in charge, either by telephone, car radio or walkie-talkie. In case of emergency the supervisor will know which officer can respond most quickly.

319

The patrolman should also carry a daily time sheet to record his building inspections. On these he notes time in, time out and anything unusual he observed, such as unauthorized occupants, missing equipment, defective or misplaced fire extinguishers, and other needed building repairs. Such reports provide information for follow-up investigation, repair work and insurance claims.

In some instances, insurance companies insist on more elaborate patrol-monitoring devices. The Detex system, for example, requires the watchman to carry a small clock containing a time disc which he punches at each station as proof of coverage. In complying with insurance requirements, the director must still insist on varying patrol patterns periodically.

To establish a professional patrol, the director should provide each officer with the following information about each building on his beat:

Entrances and exits
Opening and closing times
Occupants and uses
Name of the individual with prime responsibility
Plan of evacuation
Locations of fire extinguishers, shutoffs, fire doors, etc.
Research projects
Storage areas
Parking assignments
Special events

For special events, the officer needs to know who will use the building, when to open it and when to lock up. On routine patrol the officer enters each building, checks each door, and investigates and reports any which are lighted and unlocked. Simply asking if anyone is there is not enough. An injured person could be inside unable to answer, and if the patrolman does not find him, no one will until the following morning.

Some schools also ask patrolmen to check on the custodial staff. Since the officer knows who is supposed to be in each building at specified times, he can notify the custodial supervisor if his janitors are missing work assignments or violating proper procedures.

Investigations

Every security division with a heavy workload and a dozen men or more benefits from at least one fully trained, full-time investigator. The second-best option is to train a capable man in all aspects of investigation and assign him to part-time investigation work. The most common option among smaller schools, of course, is brief training for all officers in basic procedures for recognizing, identifying and preserving criminal evidence. The director then does follow-up investigations or brings in an expert from another police agency.

Records

Without at least a rudimentary record system, a security force can barely function. With good records, it can isolate major problems, initiate follow-up action, evaluate various solutions, and accurately project its future manpower and equipment needs at budget time. The five types of records essential to an effective security operation are:

1. Officer's Daily Log. Patrolmen complete this time sheet at the end of every shift. Because they record all incidents, arrests, citations, and investigations, these time sheets provide a complete account of work actually performed--a valuable management tool for the alert director.

2. Complaint Report. According to W. F. Wilson, a major authority in police administration, any incident requiring action, no matter how minor, should be recorded on a complaint report. If no further action is needed, the dispatcher can write up the account. Otherwise, the officer in the field writes up the report after completing his preliminary investigation. The complaint report forms the skeleton to which an Arrest Report and Identification Record are attached.

3. Arrest Report. Because of recent Supreme Court emphasis on due process, accurate arrest records are mandatory in all police work. They are the *sine qua non* for all legal proceedings. Whenever an officer makes an arrest, he must carefully note these major events: the original incident, probable cause for action, search methods, booking data, and time of release of the prisoner.

4. Identification Records. This record consists primarily of a fingerprint card and photograph. Every police department collects information on suspects it may prosecute, and many schools ask their security personnel to fingerprint and photograph all new personnel, a procedure that effectively discourages falsification of data.

5. Property Report. Police departments hold property for three major reasons: for evidence, for safekeeping, and for lost and found services. When a large volume is involved, a carefully designed property report can save considerable confusion. The director should devise one form to satisfy the purposes mentioned above and to serve also as an automobile impoundment report. A triplicate form provides one copy for the general file; one for the stolen property, if needed; and one for the receipt for the person from whom the police seized or received the property. Examples of the foregoing reports are shown as Figures 8-2, 8-3, 8-4, 8-5, and 8-6.

Indexes are the keys to an effective records system. They allow information to be filed and retrieved by several methods: by date, serial number and name and type of incident. Filing by type of incident (misdemeanor, felony, etc.) comes highly recommended by Sven Nielson of Brigham Young University. This index, he says, simplifies the job of extracting data for semester reports or other action summaries and complements chronological, numerical or name files. Nielsen also recommends a central file, alphabetically arranged to include every name appearing in other indexes. One card would name the person with cross-references to every report in which he is mentioned. With such files, an officer can quickly research the complete campus background, if any, of a suspect.

Traffic

Directing traffic is a daily duty for most security divisions. Trained officers must man heavily used intersections for morning and evening rush hours and special events such as concerts, commencements and football games. Although the job seems simple, it does require preliminary training to teach officers how to make quick, cool decisions and how to give proper signals. If not executed crisply, simple hand and arm gestures can confuse motorists, slow traffic flow unnecessarily and cause accidents.

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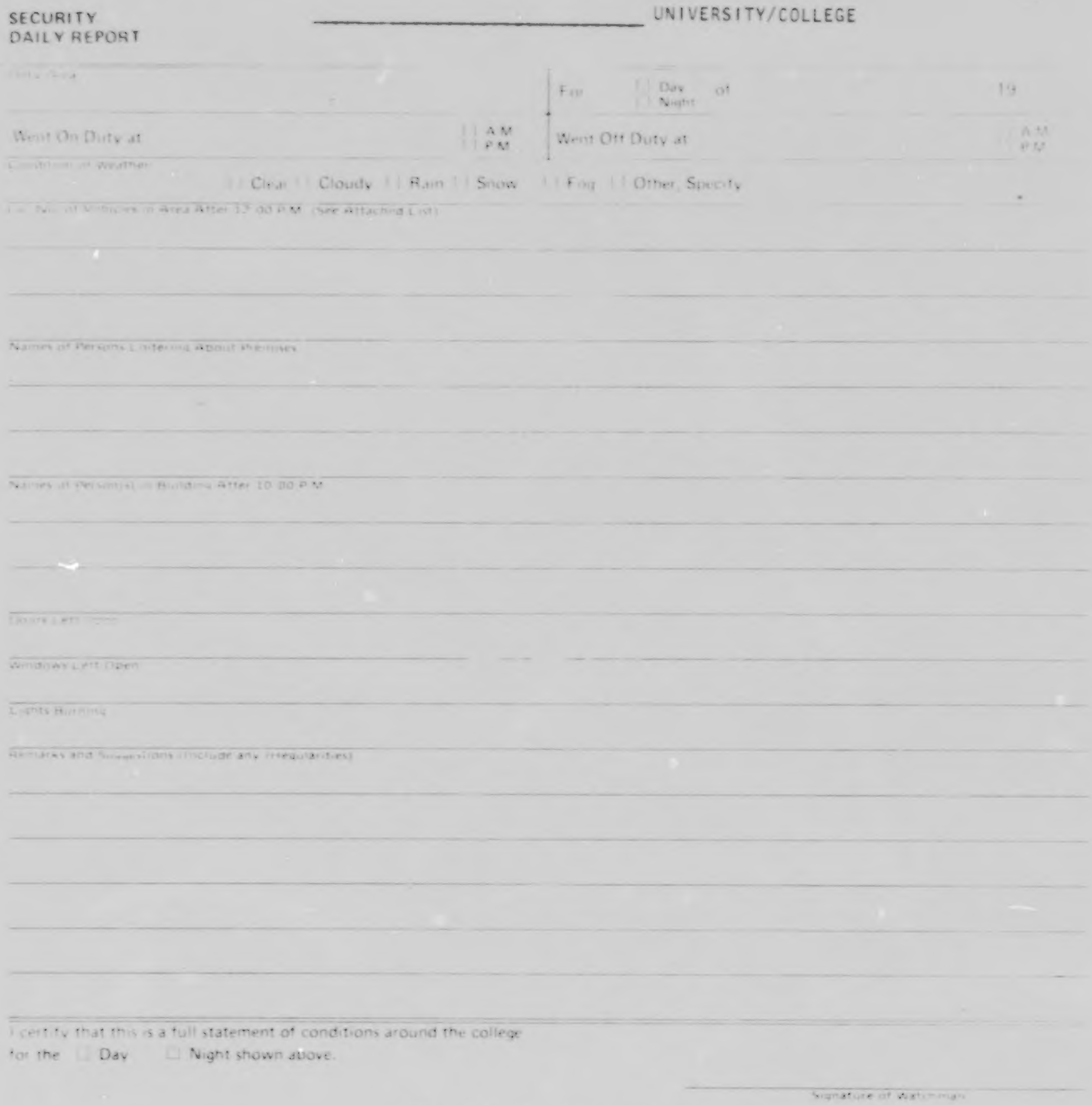

**SECURITY
DAILY REPORT**

______________________ UNIVERSITY/COLLEGE

Duty Area

For ☐ Day ☐ Night of 19

Went On Duty at ☐ A.M. ☐ P.M.

Went Off Duty at ☐ A.M. ☐ P.M.

Condition of Weather ☐ Clear ☐ Cloudy ☐ Rain ☐ Snow ☐ Fog ☐ Other, Specify

Lic. No. of Vehicles in Area After 12:00 P.M. (See Attached List)

Names of Persons Loitering About Premises

Names of Person(s) in Building After 10:00 P.M.

Doors Left Open

Windows Left Open

Lights Burning

Remarks and Suggestions (Include any Irregularities)

I certify that this is a full statement of conditions around the college for the ☐ Day ☐ Night shown above.

Signature of Watchman

Figure 8-2. Officer's Daily Log

____________________ COLLEGE
DEPARTMENT OF PUBLIC SAFETY

COMPLAINT REPORT

Reported: Date ______ Incident ______________ File Number ________
Time ______ Dispatch Time ______
Arrival Time ______
Occurred: Date ______ Location ______________ In Service ______
Time ______

Victim's name ______________________ Address ______________
SSN ________________ ______________________

Owner's name ______________________ Address ______________
SSN ________________ ______________________

Reported by ______________________ Address ______________
SSN ________________ ______________________

Witnessed by ______________________ Address ______________
SSN ________________ ______________________

Property Receipt: YES
NO

Additional Investigation Needed: YES
NO

Other Departments Notified ______________________________

NARRATIVE:

______________________ ______________ ______________
Reporting Officer's Signature ID No. Date

______________________ ______________ ______________
Watch Commander's Signature ID No. Date

Figure 8-3. Complaint Report

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____
Institution

CRIMINAL ARREST RECORD

LAST NAME	FIRST NAME	MIDDLE NAME	RACE	SEX	AGE

ALIAS	HEIGHT	WEIGHT	EYES	HAIR

ADDRESS	DATE OF BIRTH	PLACE OF BIRTH

EMPLOYER: OCCUPATION:

LOCATION OF ARREST: DATE: ______ TIME:

CHARGE	JUDGE	FINAL DISPOSITION	DATE

COMPLAINANT: ☐ Arresting Officer
☐ Other ______________________ PHONE: ______

ADDRESS: ______________________

JUSTICE OF THE PEACE: ______________ DISPOSITION AT TIME OF ARREST: ______

TRAIL DATE: ______________ LOCATION OF COURT: ______________

LIST ALL ACCOMPLICES: ______________________

HANGOUTS: HABITS: ETC: ______________________

____

FAMILY AND RELATIVES

Relation	Name	Address

FRIENDS AND ASSOCIATES

NAME	ADDRESS

CIRCUMSTANCES SURROUNDING ARREST: ______________________

____

____

____

Photographed and Fingerprinted ☐ Yes ☐ No

Figure 8-4. Criminal Arrest Record

____
Arresting Officer(s)

______________________ Police Department

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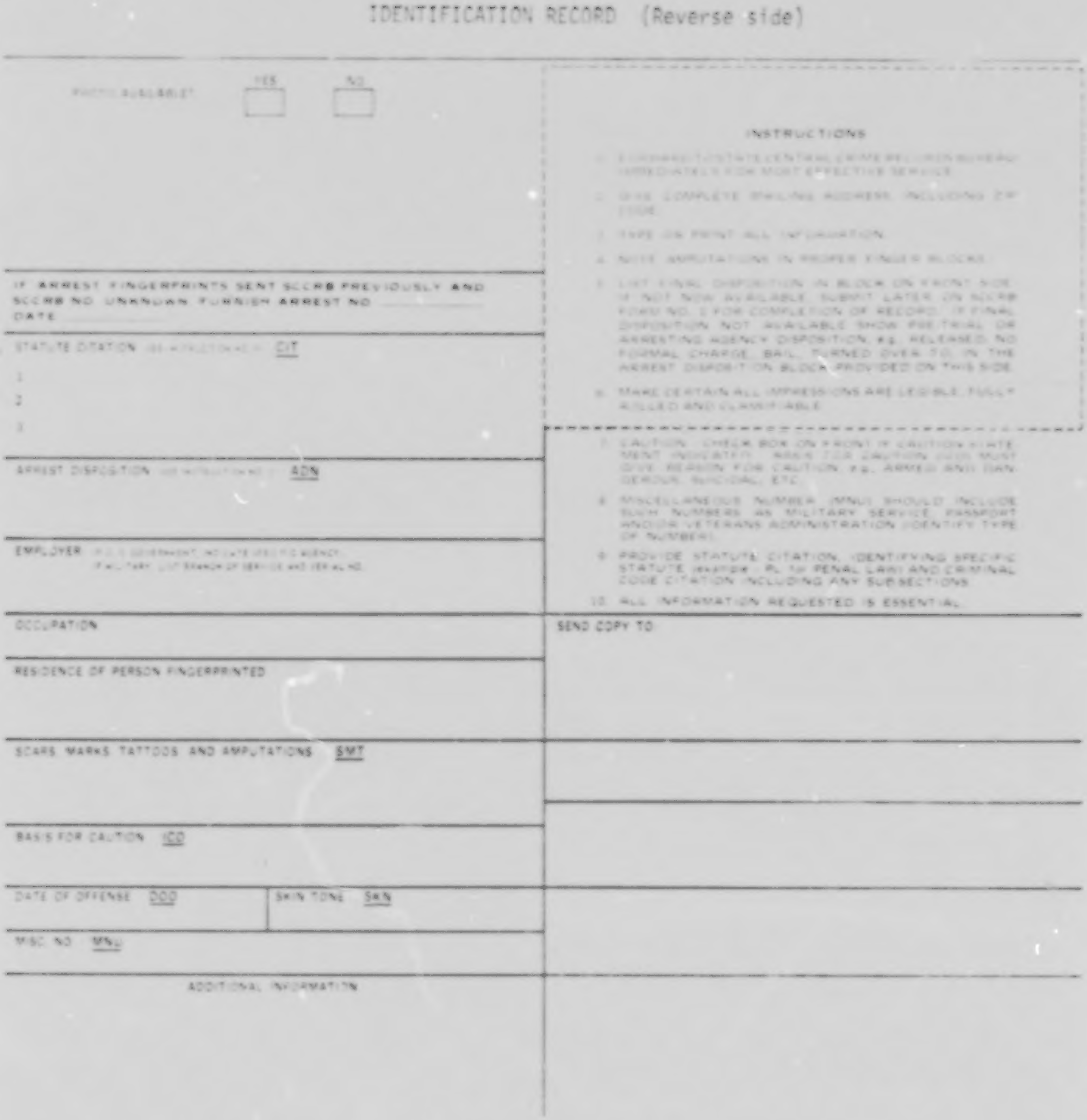

IDENTIFICATION RECORD (Reverse side)

PHOTO AVAILABLE? YES ☐ NO ☐

IF ARREST FINGERPRINTS SENT SCCRB PREVIOUSLY AND SCCRB NO. UNKNOWN FURNISH ARREST NO. ____________
DATE ____________

STATUTE CITATION (SEE INSTRUCTION NO. 9) CIT
1
2
3

ARREST DISPOSITION (SEE INSTRUCTION NO. 5) ADN

EMPLOYER (IF U.S. GOVERNMENT, INDICATE SPECIFIC AGENCY. IF MILITARY, LIST BRANCH OF SERVICE AND SERIAL NO.)

OCCUPATION

RESIDENCE OF PERSON FINGERPRINTED

SCARS, MARKS, TATTOOS, AND AMPUTATIONS SMT

BASIS FOR CAUTION ICO

DATE OF OFFENSE DOO

SKIN TONE SKN

MISC. NO. MNU

ADDITIONAL INFORMATION

INSTRUCTIONS

1. FORWARD TO STATE CENTRAL CRIME RECORDS BUREAU IMMEDIATELY FOR MOST EFFECTIVE SERVICE.
2. GIVE COMPLETE MAILING ADDRESS, INCLUDING ZIP CODE.
3. TYPE OR PRINT ALL INFORMATION.
4. NOTE AMPUTATIONS IN PROPER FINGER BLOCKS.
5. LIST FINAL DISPOSITION IN BLOCK ON FRONT SIDE. IF NOT NOW AVAILABLE, SUBMIT LATER ON SCCRB FORM NO. 2 FOR COMPLETION OF RECORD. IF FINAL DISPOSITION NOT AVAILABLE SHOW PRE-TRIAL OR ARRESTING AGENCY DISPOSITION, e.g., RELEASED, NO FORMAL CHARGE, BAIL, TURNED OVER TO, IN THE ARREST DISPOSITION BLOCK PROVIDED ON THIS SIDE.
6. MAKE CERTAIN ALL IMPRESSIONS ARE LEGIBLE, FULLY ROLLED AND CLASSIFIABLE.
7. CAUTION: CHECK BOX ON FRONT IF CAUTION STATEMENT INDICATED. BASIS FOR CAUTION (ICO) MUST GIVE REASON FOR CAUTION, e.g., ARMED AND DANGEROUS, SUICIDAL, ETC.
8. MISCELLANEOUS NUMBER (MNU) SHOULD INCLUDE SUCH NUMBERS AS MILITARY SERVICE, PASSPORT AND/OR VETERANS ADMINISTRATION (IDENTIFY TYPE OF NUMBER).
9. PROVIDE STATUTE CITATION, IDENTIFYING SPECIFIC STATUTE (example: PL for PENAL LAW) AND CRIMINAL CODE CITATION INCLUDING ANY SUBSECTIONS.
10. ALL INFORMATION REQUESTED IS ESSENTIAL.

SEND COPY TO

Figure 8-6. Identification Card
(See next page for reverse side of Identification Card.)

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IDENTIFICATION RECORD (Reverse side)

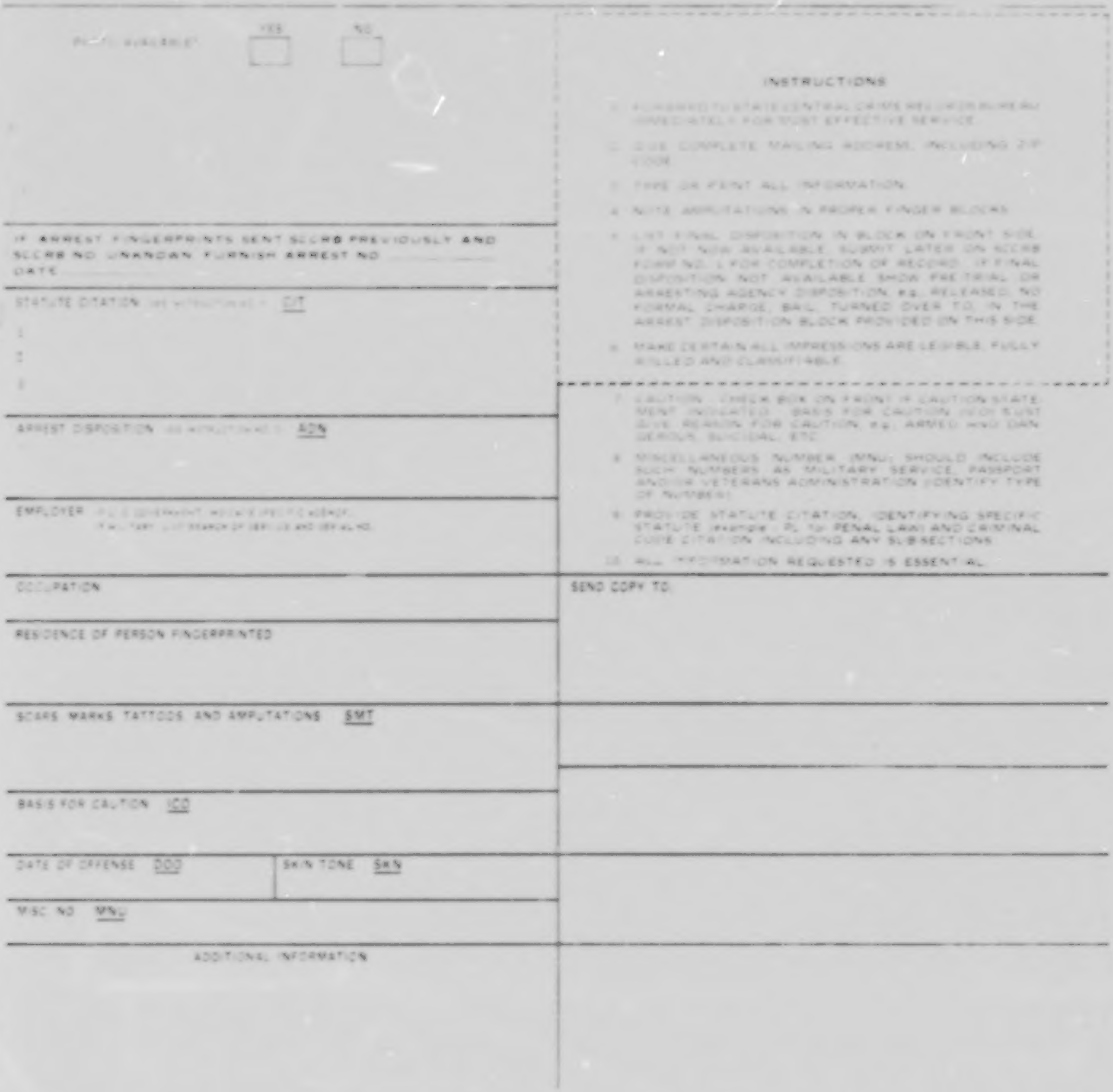


PHOTO AVAILABLE? YES ☐ NO ☐

IF ARREST FINGERPRINTS SENT SCCRB PREVIOUSLY AND SCCRB NO. UNKNOWN FURNISH ARREST NO. ____________
DATE ____________

STATUTE CITATION (SEE INSTRUCTION NO. 9) CIT
1.
2.
3.

ARREST DISPOSITION (SEE INSTRUCTION NO. 5) ADN

EMPLOYER (IF U.S. GOVERNMENT, INDICATE SPECIFIC AGENCY; IF MILITARY, LIST BRANCH OF SERVICE AND SERIAL NO.)

OCCUPATION

RESIDENCE OF PERSON FINGERPRINTED

SCARS, MARKS, TATTOOS, AND AMPUTATIONS SMT

BASIS FOR CAUTION ICO

DATE OF OFFENSE DOO

SKIN TONE SKN

MISC. NO. MNU

ADDITIONAL INFORMATION

INSTRUCTIONS

1. FORWARD TO STATE CENTRAL CRIME RECORDS BUREAU IMMEDIATELY FOR MOST EFFECTIVE SERVICE.
2. GIVE COMPLETE MAILING ADDRESS, INCLUDING ZIP CODE.
3. TYPE OR PRINT ALL INFORMATION.
4. NOTE AMPUTATIONS IN PROPER FINGER BLOCKS.
5. LIST FINAL DISPOSITION IN BLOCK ON FRONT SIDE. IF NOT NOW AVAILABLE, SUBMIT LATER ON SCCRB FORM NO. 1 FOR COMPLETION OF RECORD. IF FINAL DISPOSITION NOT AVAILABLE SHOW PRE-TRIAL OR ARRESTING AGENCY DISPOSITION, e.g., RELEASED, NO FORMAL CHARGE, BAIL, TURNED OVER TO, IN THE ARREST DISPOSITION BLOCK PROVIDED ON THIS SIDE.
6. MAKE CERTAIN ALL IMPRESSIONS ARE LEGIBLE, FULLY ROLLED AND CLASSIFIABLE.
7. CAUTION - CHECK BOX ON FRONT IF CAUTION STATEMENT INDICATED. BASIS FOR CAUTION (ICO) MUST GIVE REASON FOR CAUTION, e.g., ARMED AND DANGEROUS, SUICIDAL, ETC.
8. MISCELLANEOUS NUMBER (MNU) SHOULD INCLUDE SUCH NUMBERS AS MILITARY SERVICE, PASSPORT AND/OR VETERANS ADMINISTRATION (IDENTIFY TYPE OF NUMBER).
9. PROVIDE STATUTE CITATION, IDENTIFYING SPECIFIC STATUTE (example: PL for PENAL LAW) AND CRIMINAL CODE CITATION INCLUDING ANY SUBSECTIONS.
10. ALL INFORMATION REQUESTED IS ESSENTIAL.

SEND COPY TO:

Figure 8-8. Identification Card (Reverse side)

BEST COPY AVAILABLE ________________________ COLLEGE/UNIVERSITY POLICE

OTHER DEPT. CASE NO.	**RECEIPT FOR PROPERTY** ☐	**EVIDENCE** ☐	CASE NO.
OFFENSE	ADDRESS WHERE PROPERTY IMPOUNDED	NAME	
REASON FOR IMPOUNDMENT			DATE AND TIME IMPOUNDED

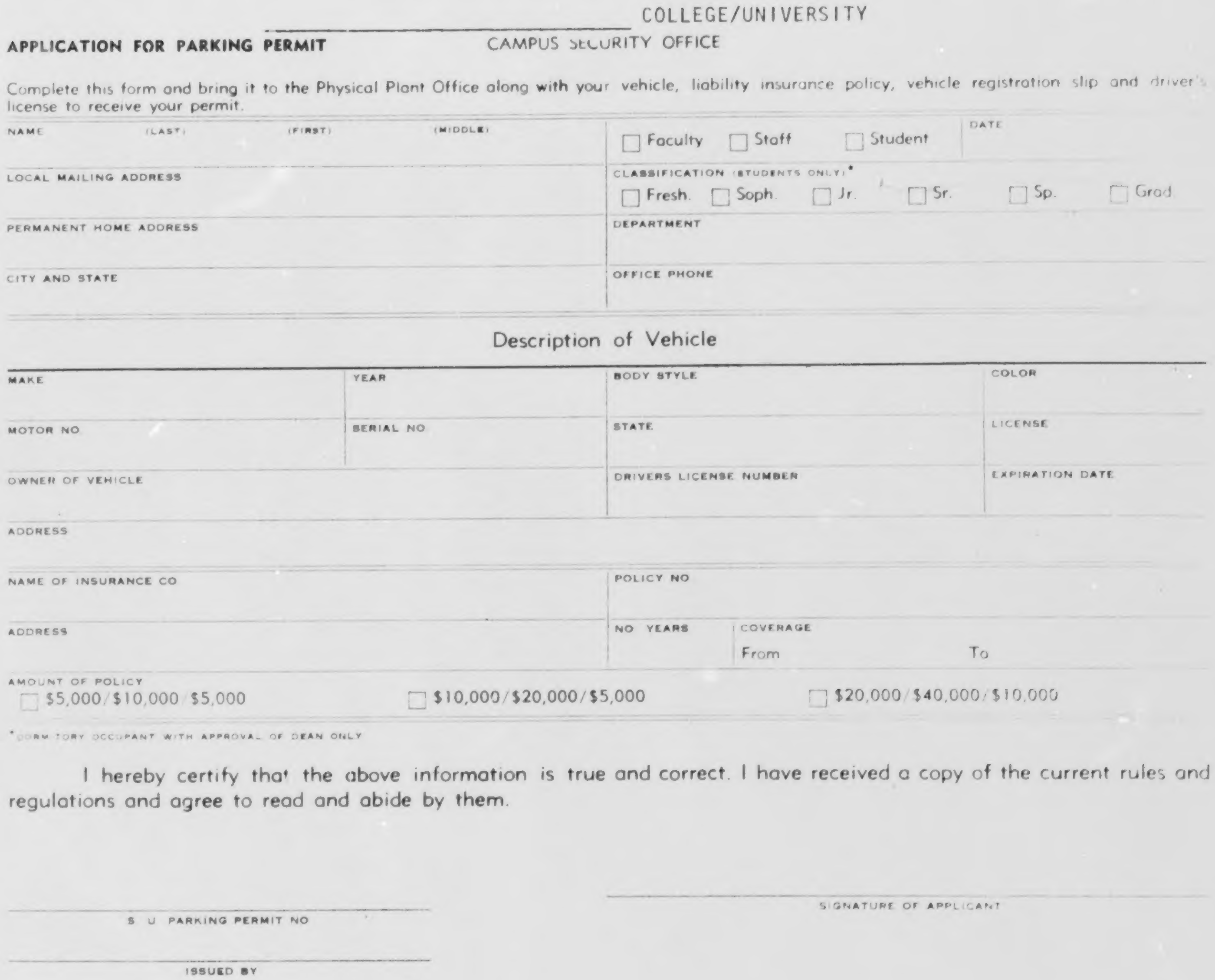
ITEM NO.	QUANTITY	DESCRIPTION

Figure 8-8. Property Report

I hereby acknowledge that the above list represents all property taken from my possession and that I have received a copy of this receipt.

I hereby acknowledge that the above list represents all property impounded by me in the official performance of duty as a Police Officer.

SIGNATURE X	IMPOUNDING OFFICER X	SERIAL NO.	DEPT.
RECEIVED BY	REASON	DATE AND TIME RECEIVED	
RECEIVED BY	REASON	DATE AND TIME RECEIVED	
RECEIVED BY	REASON	DATE AND TIME RECEIVED	
RECEIVED BY	REASON	DATE AND TIME RECEIVED	
RECEIVED BY	REASON	DATE AND TIME RECEIVED	
RECEIVED BY	REASON	DATE AND TIME RECEIVED	
RECEIVED BY	REASON	DATE AND TIME RECEIVED	
FINAL DISPOSITION	AUTHORITY	DATE AND TIME OF DISPOSITION	



______________________ COLLEGE/UNIVERSITY

APPLICATION FOR PARKING PERMIT CAMPUS SECURITY OFFICE

Complete this form and bring it to the Physical Plant Office along with your vehicle, liability insurance policy, vehicle registration slip and driver's license to receive your permit.

NAME (LAST) (FIRST) (MIDDLE)		☐ Faculty ☐ Staff ☐ Student	DATE
LOCAL MAILING ADDRESS		CLASSIFICATION (STUDENTS ONLY)* ☐ Fresh. ☐ Soph. ☐ Jr. ☐ Sr. ☐ Sp. ☐ Grad	
PERMANENT HOME ADDRESS		DEPARTMENT	
CITY AND STATE		OFFICE PHONE	

Description of Vehicle

MAKE	YEAR	BODY STYLE	COLOR
MOTOR NO	SERIAL NO	STATE	LICENSE
OWNER OF VEHICLE		DRIVERS LICENSE NUMBER	EXPIRATION DATE
ADDRESS			
NAME OF INSURANCE CO		POLICY NO	
ADDRESS		NO YEARS	COVERAGE From To

AMOUNT OF POLICY

☐ $5,000/$10,000/$5,000 ☐ $10,000/$20,000/$5,000 ☐ $20,000/$40,000/$10,000

*DORMITORY OCCUPANT WITH APPROVAL OF DEAN ONLY

I hereby certify that the above information is true and correct. I have received a copy of the current rules and regulations and agree to read and abide by them.

S U PARKING PERMIT NO

SIGNATURE OF APPLICANT

ISSUED BY

Figure 8-7. Vehicle Registration Form

Security personnel also enforce speed limits, respond to accidents, escort emergency vehicles, and check on vehicles obstructing traffic flow through the campus.

The overall traffic pattern and sign placements that control this flow usually originate from the physical plant office. Security officers, however, try to identify major problems and, on the basis of their observations, recommend workable solutions. Continuous cooperation is the key to an efficient campus traffic plan.

Parking

Another traditional headache of the security division is parking. As with traffic problems, the physical plant planning office designs and constructs parking areas and designates each as a student, faculty or staff lot. Ideally, a committee of student, faculty and staff members recommends general policies, writes traffic and parking regulations, draws up lot assignments and sets registration procedures applying to everyone driving a vehicle on campus. The role of the security division is to operate the registration machinery and enforce parking regulations. Figure 8-7 is a sample vehicle registration form.

The most effective way to handle registration is to file cards for each vehicle owner under three headings: name, vehicle license number and campus sticker number. The most effective way to enforce regulations is to ticket violators and tow away parked cars posing safety hazards or belonging to flagrant repeaters. As mentioned earlier, part-time students can handle most of this ticketing.

Public Relations

Good public relations should concern every security director, supervisor, officer or watchman. For a college security force, the most important public is the campus population. A force that can generate calm, if not congenial relationships with students and faculty greatly simplifies its work.

The division also carries an important responsibility toward the general public. In many cases, the security officer is the first representative a visitor meets. If officers provide correct information in a courteous manner, they create good first impressions that can contribute significantly to a positive public image of the institution.

Good public relations, like good patrols, result from planning and training. The director should prepare and present to each employee a digest of important information about the school and supplement it with weekly or daily sheets listing times and locations of current campus events. From these sources and from his own experiences, an officer should be able to answer most questions he receives.

Training in attitudes is more difficult to provide and evaluate than training in techniques. Some schools enroll their officers in part-time courses in interpersonal relations, and a few send them to sensitivity sessions. Any method used should emphasize one key fact: The security department is primarily a service organization, and students, faculty and the public are its clients.

Further guidelines on public relations come from Robert Tonis of Harvard, who stresses the importance of the following policies:

1. Answer every telephone call in a courteous businesslike manner.
2. Respond promptly to all calls, no matter how trivial they seem. Slow response only reinforces the repeated complaint that "You can never find a cop when you need one."
3. Answer all letters, no matter how derogatory or complimentary, with a written reply or personal visit.
4. Accept and record all criticisms, evaluate their relevance and correct any real deficiencies.

SAFETY

Aspiring administrators traditionally promise to improve safety programs with the fervor of aspiring politicians promising to reduce taxes. And often with the same results. Once in office, both administrators and legislators usually find other more pressing uses for available money. In the past, one result of these attitudes was a poor safety record nationwide for college and university physical plant departments. At one point in the early 1960's, the National Safety Council ranked physical plant work with dangerous occupations such as construction and marine transportation.

With the advent of OSHA, however, legislators began pressuring industries and institutions to improve their safety procedures. College administrators began to discover what some industrial managers realized decades ago: Good safety is good business--it not only saves lives and limbs, it also saves lost time.

For colleges and universities, a thorough safety program should cover fire prevention, traffic, working conditions, and laboratory practices. At small schools, the primary responsibility for these varied tasks inevitably falls on one man. Usually it is the security director or one of his subordinates who handles this assignment on a part-time basis. An interdepartmental committee may recommend procedures and review the total program, but for efficient administration, responsibility for the total program should be centered around one person.

GENERAL PROCEDURES

Once the physical plant director has appointed a safety coordinator he cannot simply forget him and his program. The safety officer needs the director's help, especially his clout. As safety coordinator, he reviews procedures in all departments and assigns responsibility for specific problems. His range of influence includes activities as diverse as training new employees, purchasing new equipment and revising work practices. He needs cooperation from deans, department heads, supervisors, foremen, and employees, many of whom may resent intrusions into their bailiwick. The physical plant director, therefore, should supply authoritative encouragement in whatever form is most effective and least abrasive. Unless the safety officer has cooperation or authority, the institution has a safety program in name only.

A safety committee can also help. It should meet periodically, perhaps monthly, to read accident summaries and progress reports. It also can review work of the safety supervisor to insure that he has the cooperation he needs and to check that he does not abuse the authority he holds.

Following are brief suggestions about general elements of a successful safety program.

Plan Review

A good plan review is the first step, the critical ounce of prevention. A safety expert can save lives and money by pointing out safety flaws in construction drawings, traffic plans and laboratory procedures. Because safety is his specialty he can find the danger spots that can produce fires in buildings and injuries to the employees who work in them. By assuring ahead of time that the planned project complies with complicated building safety and fire protection codes, he can save the school money that might otherwise go into expensive post completion changes.

To conduct an effective plan review, he must build and maintain a library of reference materials from the National Safety Council, National Fire Protection Association, local OSHA office, and experts on radioactivity and other laboratory hazards. In addition, he must keep current with legislation requiring new buildings to incorporate ramps, railings, grab bars, and other design features that facilitate access and circulation for handicapped people.

Inspections

A regular inspection schedule is the heart of any safety program. In many cases, the officer must bring in specialists such as fire marshals and safety engineers to inspect the premises. Insurance companies of course also send representatives to see whether the institution is complying with policy requirements. From such experts the safety coordinator can prepare action lists that detail all important corrections such as remedial remodeling, extra fire doors and installation of fire dampers in ventilating ducts. With expert advice he can compile a safety checklist to guide his own inspection tours.

Record Keeping

Records are most important to help the safety officer answer certain questions: What are the most frequent kinds of accidents? Where do they occur? Without such information he is operating in a vacuum. In most cases, other departments in the university compile the records he needs. As coordinator, he must arrange a reporting procedure that will channel relevant information across his desk. He needs information about these problems:

Basic Records

1. Property damage. The business office is the important source. It collects this kind of information for insurance claims.

2. Equipment damage. The business office collects this data also.

3. Traffic accidents. Someone must investigate and report all accidents. This job may fall to either the security or the safety officer.

4. Fire losses. This is inevitably a chief responsibility of the safety expert. In many cases he works in concert with fire investigators and reports his information to the business office.

5. Workmen's Compensation. The personnel and payroll department usually records this information on standard forms required by state law.

6. OSHA. The federal government requires institutions to keep records pertinent to occupational safety and health conditions. Often this information can be kept on forms similar to those used for workmen's compensation.

Samples of basic records are shown as Figures 8-8, 8-9, and 8-10.

Efficiency Records

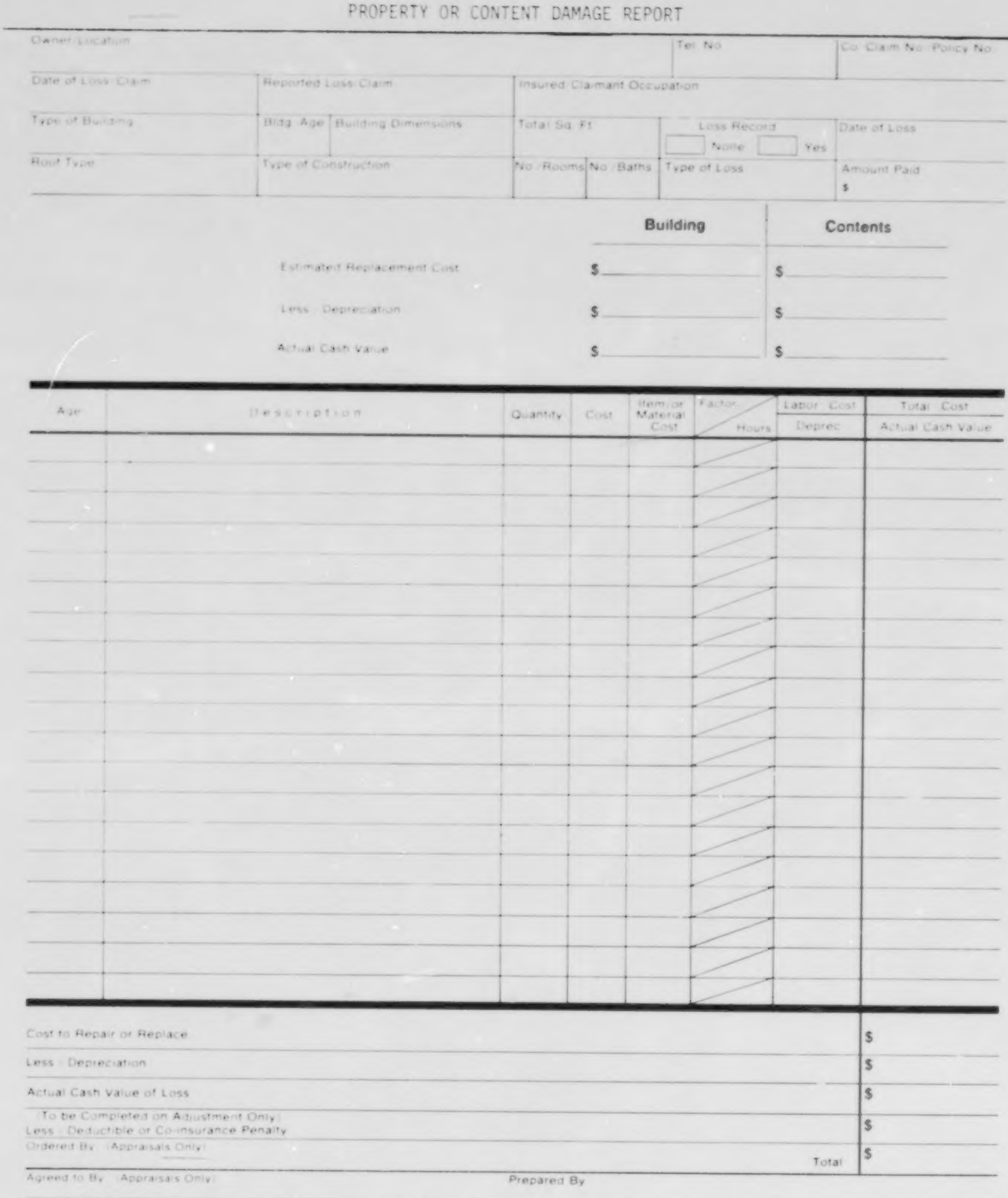
With this basic information the safety officer gradually can identify the strong and weak points of his program and devise records to measure its overall effectiveness. With these efficiency records he can compare annually the campus program with its previous performance and with national standards. For safety the two major types of efficiency records are:

1. Accident Frequency Rate. This rate measures the number of disabling injuries per million man-hours worked. in 1960 university physical plant departments operating without planned safety programs averaged 19.3 disabling injuries per million man-hours worked. According to the National Safety Council, this rate tripled the nationwide average of 6.04 for all industries.

2. Loss Ratio. This statistic shows annual dollar costs of such accidents for every thousand man-hours worked. When university physical plant departments suffered an accident frequency rate of 19.3, they also lost $12.55 for every thousand man-hours. For management purposes, this may be the more informative record, since it gives a direct reading in dollars.

FIRE PROTECTION

Most schools call on local fire departments to combat fires on their premises. The most important element in fire protection, however, is not a good fire department but an effective prevention program. This work requires more time than any other safety job. Only very large schools or very rich ones can afford a full-time, fully trained fire protection expert, but every school must assign at least one part-time, partially trained man to the job. It is his task to coordinate all fire protection activities and to call in specialists to help with complex problems.



PROPERTY OR CONTENT DAMAGE REPORT

Owner/Location				Tel. No.	Co. Claim No./Policy No.
Date of Loss/Claim	Reported Loss/Claim		Insured/Claimant Occupation		
Type of Building	Bldg. Age	Building Dimensions	Total Sq. Ft.	Loss Record ☐ None ☐ Yes	Date of Loss
Roof Type	Type of Construction		No./Rooms No./Baths	Type of Loss	Amount Paid $

	Building	Contents
Estimated Replacement Cost	$	$
Less: Depreciation	$	$
Actual Cash Value	$	$

Age	Description	Quantity	Cost	Item/or Material Cost	Factor / Hours	Labor Cost Deprec	Total Cost Actual Cash Value

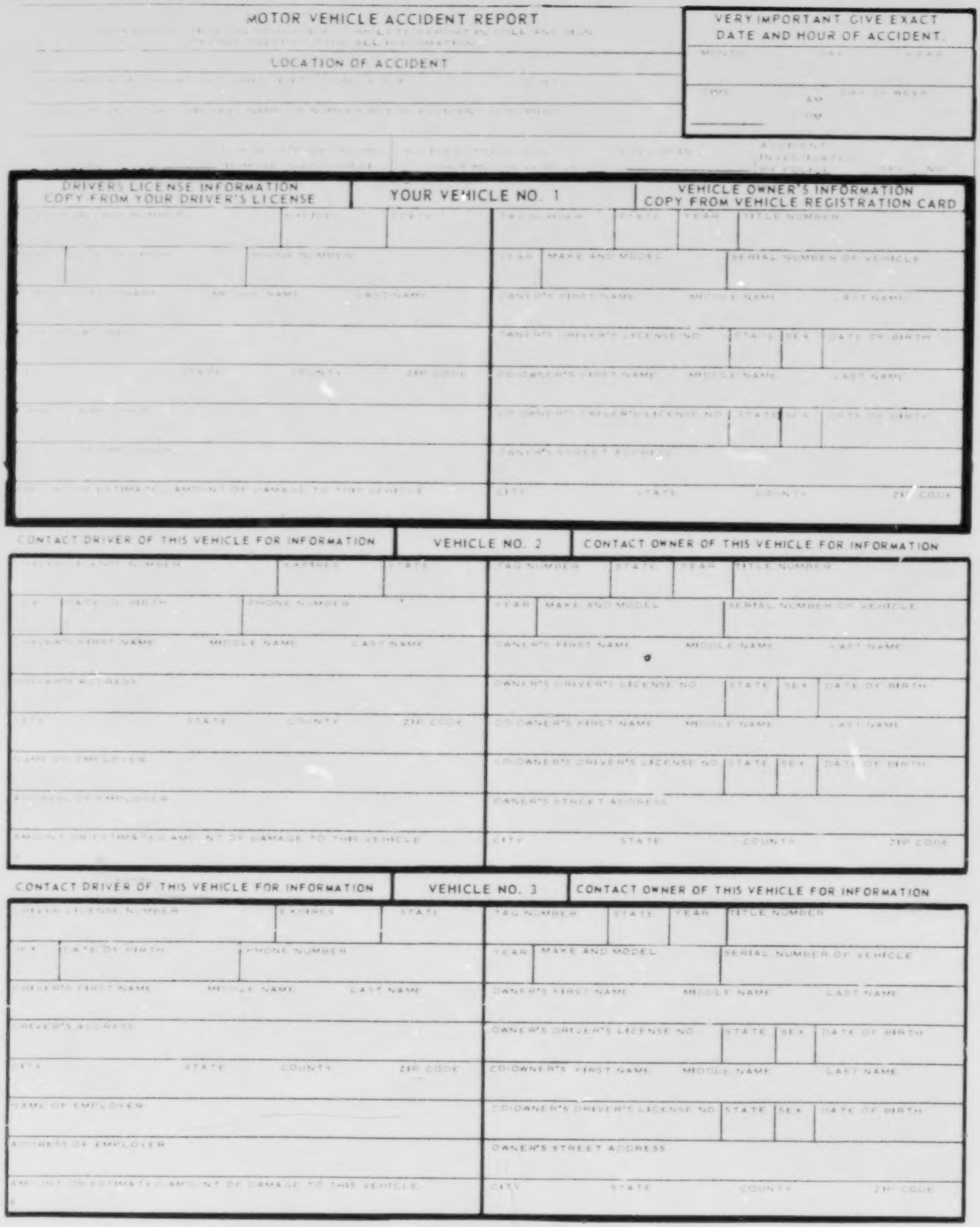
Cost to Repair or Replace	$
Less: Depreciation	$
Actual Cash Value of Loss	$
(To be Completed on Adjustment Only) Less: Deductible or Co-insurance Penalty	$
Ordered By: (Appraisals Only) Total	$

Agreed to By: (Appraisals Only)

Prepared By

Figure 8-8.

BEST COPY AVAILABLE



MOTOR VEHICLE ACCIDENT REPORT

[illegible]

LOCATION OF ACCIDENT

[illegible]

VERY IMPORTANT GIVE EXACT DATE AND HOUR OF ACCIDENT.	
MONTH DAY YEAR	
TIME AM PM	DAY OF WEEK

ACCIDENT INVESTIGATED BY POLICE YES NO

DRIVERS LICENSE INFORMATION COPY FROM YOUR DRIVER'S LICENSE — **YOUR VEHICLE NO. 1** — **VEHICLE OWNER'S INFORMATION COPY FROM VEHICLE REGISTRATION CARD**

DRIVER LICENSE NUMBER / EXPIRES / STATE	TAG NUMBER / STATE / YEAR / TITLE NUMBER
SEX / DATE OF BIRTH / PHONE NUMBER	YEAR / MAKE AND MODEL / SERIAL NUMBER OF VEHICLE
DRIVER'S FIRST NAME / MIDDLE NAME / LAST NAME	OWNER'S FIRST NAME / MIDDLE NAME / LAST NAME
DRIVER'S ADDRESS	OWNER'S DRIVER'S LICENSE NO / STATE / SEX / DATE OF BIRTH
CITY / STATE / COUNTY / ZIP CODE	CO-OWNER'S FIRST NAME / MIDDLE NAME / LAST NAME
NAME OF EMPLOYER	CO-OWNER'S DRIVER'S LICENSE NO / STATE / SEX / DATE OF BIRTH
ADDRESS OF EMPLOYER	OWNER'S STREET ADDRESS
AMOUNT OR ESTIMATED AMOUNT OF DAMAGE TO THIS VEHICLE	CITY / STATE / COUNTY / ZIP CODE

CONTACT DRIVER OF THIS VEHICLE FOR INFORMATION — **VEHICLE NO. 2** — **CONTACT OWNER OF THIS VEHICLE FOR INFORMATION**

DRIVER LICENSE NUMBER / EXPIRES / STATE	TAG NUMBER / STATE / YEAR / TITLE NUMBER
SEX / DATE OF BIRTH / PHONE NUMBER	YEAR / MAKE AND MODEL / SERIAL NUMBER OF VEHICLE
DRIVER'S FIRST NAME / MIDDLE NAME / LAST NAME	OWNER'S FIRST NAME / MIDDLE NAME / LAST NAME
DRIVER'S ADDRESS	OWNER'S DRIVER'S LICENSE NO / STATE / SEX / DATE OF BIRTH
CITY / STATE / COUNTY / ZIP CODE	CO-OWNER'S FIRST NAME / MIDDLE NAME / LAST NAME
NAME OF EMPLOYER	CO-OWNER'S DRIVER'S LICENSE NO / STATE / SEX / DATE OF BIRTH
ADDRESS OF EMPLOYER	OWNER'S STREET ADDRESS
AMOUNT OR ESTIMATED AMOUNT OF DAMAGE TO THIS VEHICLE	CITY / STATE / COUNTY / ZIP CODE

CONTACT DRIVER OF THIS VEHICLE FOR INFORMATION — **VEHICLE NO. 3** — **CONTACT OWNER OF THIS VEHICLE FOR INFORMATION**

DRIVER LICENSE NUMBER / EXPIRES / STATE	TAG NUMBER / STATE / YEAR / TITLE NUMBER
SEX / DATE OF BIRTH / PHONE NUMBER	YEAR / MAKE AND MODEL / SERIAL NUMBER OF VEHICLE
DRIVER'S FIRST NAME / MIDDLE NAME / LAST NAME	OWNER'S FIRST NAME / MIDDLE NAME / LAST NAME
DRIVER'S ADDRESS	OWNER'S DRIVER'S LICENSE NO / STATE / SEX / DATE OF BIRTH
CITY / STATE / COUNTY / ZIP CODE	CO-OWNER'S FIRST NAME / MIDDLE NAME / LAST NAME
NAME OF EMPLOYER	CO-OWNER'S DRIVER'S LICENSE NO / STATE / SEX / DATE OF BIRTH
ADDRESS OF EMPLOYER	OWNER'S STREET ADDRESS
AMOUNT OR ESTIMATED AMOUNT OF DAMAGE TO THIS VEHICLE	CITY / STATE / COUNTY / ZIP CODE

Figure 8-9.

BEST COPY AVAILABLE

KILLED OR INJURED

1	FIRST NAME	MIDDLE	LAST NAME		ADDRESS		
	KILLED INJURED	DRIVER PASSENGER	IN VEHICLE NO. ____	PEDESTRIAN	AGE	SEX	NATURE OF INJURY
2	FIRST NAME	MIDDLE	LAST NAME		ADDRESS		
	KILLED INJURED	DRIVER PASSENGER	IN VEHICLE NO. ____	PEDESTRIAN	AGE	SEX	NATURE OF INJURY
3	FIRST NAME	MIDDLE	LAST NAME		ADDRESS		
	KILLED INJURED	DRIVER PASSENGER	IN VEHICLE NO. ____	PEDESTRIAN	AGE	SEX	NATURE OF INJURY
4	FIRST NAME	MIDDLE	LAST NAME		ADDRESS		
	KILLED INJURED	DRIVER PASSENGER	IN VEHICLE NO. ____	PEDESTRIAN	AGE	SEX	NATURE OF INJURY

PROPERTY DAMAGE (OTHER THAN MOTOR VEHICLES)

DAMAGE TO PROPERTY	AMOUNT OF DAMAGES $
DAMAGED PROPERTY OWNER'S NAME	ADDRESS

DESCRIBE THE ACCIDENT IN DETAIL AND INCLUDE ROAD AND WEATHER CONDITIONS. (REFER TO YOUR VEHICLE AS NO. 1, OTHERS AS 2, 3, ETC.)

INSURANCE INFORMATION MUST BE COMPLETED.

NAME OF LIABILITY INSURANCE CO.			
ADDRESS OF INSURANCE CO.			
NAME OF INSURANCE AGENT			POLICY NUMBER
ADDRESS OF AGENT			EFFECTIVE DATE
SIGN HERE ▶ SIGNATURE OF PERSON MAKING REPORT	ADDRESS	DATE	☐ OWNER ☐ DRIVER

INSTRUCTIONS

WHO MUST REPORT Regardless of fault, the operator of every motor vehicle involved in a motor vehicle accident within this State, which has resulted in death or personal injury, or damage of over $100.00 to the property of any one person, must report the accident to the State Motor Vehicle Administration on this Accident Report. (A report by an investigating officer does not relieve anyone involved of this obligation.)

Reverse side Figure 8-3.

BEST COPY AVAILABLE

Figure 8-2.

Complete and send immediately to --

WORKMEN'S COMPENSATION COMMISSION

STANDARD FORM FOR EMPLOYER'S FIRST REPORT OF INJURY OR OCCUPATIONAL DISEASE

DO NOT WRITE IN THIS SPACE

WCC CLAIM #

DOCTOR'S REPORT Yes ☐ No ☐

SOUNDEX #

EVERY QUESTION MUST BE ANSWERED AND FORM SIGNED

PLEASE PRINT OR TYPE

1. EMPLOYER — Name — (Give name under which concern does business)

2. Mail Address — (No. and Street) (City or Town) (State) (Zip) Phone

3. Nature of Business — (Manufacturing shoes, retailing men's clothes, trucking, etc.) | 3a. Insured By — (Name of company)

4. TIME AND PLACE — Location of plant or place where accident or disease occurred | Department — State if employer's premises — Yes ☐ No ☐

5. Date of injury 19 Day of week Hour of day A.M. ☐ P.M. ☐ | 6. Was injured paid for one half or more for day of injury? Yes ☐ No ☐

7. Date disability began 19 A.M. ☐ P.M. ☐ | When did you or foreman first know of injury? | Name of foreman

8. INJURED PERSON — Name of injured — (First — Middle — Last Name) | Social Security No.

9. Address — (No. and Street) (City or Town) (State) (Zip)

10. Check (✓) Married ☐ Single ☐ Widowed ☐ Divorced ☐ Male ☐ Female ☐ | 11. Nationality | Speak English Yes ☐ No ☐

12. Age | Did you have on file employment certificate or permit? Yes ☐ No ☐ | (a) Occupation when injured

13. Was this his or her regular occupation? Yes ☐ No ☐ (If not, state in what department or branch of work regularly employed)

14. How long employed by you? | (a) Piecework ☐ Timework ☐ | 15. No. of hours worked per day per week | No. of days worked per week

16. Wages $ per hour, or $ per day, or $ per week | If paid on other than a time basis, such as piece work or commission — Average weekly earnings $

17. If board, lodging, tips, fuel or other advantages were furnished in addition to wages, give estimated value per day, week or month

18. CAUSE AND NATURE OF INJURY OR OCCUPATIONAL DISEASE | 19. Probable length of disability

20. Machine, tool or thing causing injury | 21. Kind of power (hand, foot, electrical, steam, etc.)

22. Part of machine on which accident occurred | 23. (a) Was safety appliance or regulation provided (b) Was it in use at time

24. Was accident caused by injured's failure to use or observe safety appliance or regulation

25. Has injured returned to work? Yes ☐ No ☐ If so, date and hour | a. At what wage $ | b. At what occupation?

26. Name and address of physician

27. Name and address of hospital

28. FATAL CASES — Has injured died ☐ Yes ☐ No | If yes give date of death

Date of this report Firm Name

Signed by (Official Title)

Plan Review

His job logically begins when a building begins. All basic construction drawings should cross his desk and receive his approval before ground is broken. He checks all plans against codes required by federal and state agencies and recommended by such organizations as the National Fire Protection Association, the American Society for Testing Materials, and the American National Standards Institute. In light of their provisions he can evaluate the planned building by checking for features such as corridors that provide alternate escape routes, fire doors that retard spread of flames and smoke, sprinkler systems that adequately cover all floor area, and fire extinguishers that are appropriate to the building materials and equipment used.

Inspections

Usually, however, the fire protection expert begins with existing buildings, many of which were designed decades before he was born and before many current fire codes, fire protection features and fire fighting methods were devised. His first step, therefore, should be an extensive survey of the campus. On such a tour he identifies potential fire hazards in structures and in housekeeping procedures for handling rubbish, chemicals and flammable materials. He also examines and evaluates alarms, extinguishers, sprinklers, fire doors, and escapes. Inevitably on every survey will appear the recommendations that fire doors must not be propped open. The best that physical plant can do is to warn the occupants of the dangers to life safety by stenciling or attaching warning labels.

FIRE DOOR - KEEP CLOSED

IT IS UNLAWFUL TO PROP THIS DOOR OPEN

This survey should produce a list of remedial work for immediate and long-term action.

Additional inspections should follow on a regular schedule. For some inspections, the safety director should call in the local fire chief. On such tours the fire chief can learn the layout of college buildings, and the safety supervisor can develop closer working relationships with the department and learn more about the fire chief's specialty--protecting people. From insurance inspectors who also tour the campus periodically to check on policy compliance, the supervisor can learn more about this inspector's specialty--protecting property.

Equipment

Fire Alarms. Fire alarms should be designed into the wiring capabilities of a building during its planning stage. Ideally, all systems should connect with the campus fire department, if there is one, as well as with the campus security office, and local fire and police departments. With cutoff switches alarms can be tested periodically without disturbing public agencies. More sophisticated systems have both local alarms within the buildings and an annunciator in each main entrance hall to show where in the building the fire originated.

Sprinklers. Sprinkler systems can involve complicated design decisions. Architects and engineers work out basic calculations to determine the number of sprinkler heads, area each head should cover and size of the piping required. The safety officer works with these professionals and reviews their efforts for final approval. To adequately protect the school's interest during this critical process, he must simply dig into the technology of sprinklers as deeply as he can, ask every question that occurs to him and insist that designers clearly explain all options.

A key choice is between a wet or a dry system. A wet system holds water all the time for instant discharge but runs the risk of occasional freeze up. A dry system eliminates this risk but does not respond as quickly.

Another decision centers on how the system should be activated. Most sprinklers are heat-activated but cause considerable water damage when responding to small or localized fires. The supervisor, therefore, must decide how to shut off the system and who should have this authority. How to test sprinklers of course, is another puzzler he must research before making any recommendations.

Fire Extinguishers. Even though a building may be well-equipped with alarms, sprinklers and other fire protection devices, it still needs portable fire extinguishers accessible and ready for emergency use. With a good portable extinguisher, even an untrained person can often put out a small blaze before it activates the sprinklers or even slow the spread of a large fire until professionals arrive. The right extinguisher in the right place at the right time can save lives, lost work time, valuable equipment, and millions of dollars. Their technology is complicated, however, which means the safety supervisor must also develop considerable expertise about extinguishers before buying, placing and maintaining them.

Types

Extinguishers come in a wide variety of types, each of which is designed for certain kinds of fires. Since no extinguisher is suitable for every fire, it is essential that each piece be clearly identified and properly labeled to avoid misplacement and misuse.

Class A extinguishers are used on common fires: wood, paper, rubber and many plastics. They contain water, loaded stream, foam, or a combination of dry chemicals. Maximum travel distance to one should not exceed 75 feet, and maximum coverage should average 3,000 square feet.

Class B extinguishers are suitable for fires in flammable liquids, gases and greases. They hold loaded stream, foam, compressed gas (bromotrifluoromethane and carbon dioxide), dry chemicals, multipurpose dry chemicals, and vaporizing liquids. The maximum travel distance to this extinguisher should be 50 feet.

Class C extinguishers are designed primarily for fires stemming from or surrounding electrical equipment. Spraying water on this kind of blaze could electrocute the firefighter; what is needed is an extinguisher with nonconducting flame suppressants.

Class D extinguishers work well on fires in combustible metals such as magnesium, tatanium, zirconium, sodium, and potassium. The nameplate for each piece should explain its relative effectiveness for each kind of metal fire.

For complete information on fire extinguishers see APPENDIX 8-A. For additional information the safety supervisor should consult local authorities and write to such agencies as:

The National Fire Protection Association
470 Atlantic Avenue
Boston, Massachusetts 02110

National Safety Council
425 North Michigan Avenue
Chicago, Illinois 60611

Maintenance

The safety office cannot simply install an extinguisher and forget it. As time passes, both parts and materials may decay enough to render it inoperable. Someone, therefore, must periodically examine the device, and repair, recharge or replace it if necessary. That person could be the safety officer, one of his subordinates or possibly a private contractor. Because this maintenance can be frequent and repetitious, many schools find it simplest to hire a commercial firm to handle it.

The major maintenance chore is an annual examination of each piece. At that time, the maintenance man thoroughly checks the mechanical parts for breakage and corrosion and examines the contents for deterioration and leakage. He repairs what is broken, replaces what is missing and records his work on a dated tag affixed to the extinguisher. Whoever performs this work will need all the technical data pertinent to each type of extinguisher.

Also necessary is a monthly inspection to see that each extinguisher is in its designated place, and is visible, accessible, undamaged and free from obvious defects. On this tour, the inspector also verifies that the maintenance tag is up to date.

TRAFFIC

Traffic safety is a concern that crosses departmental lines. The planning committee, department or private firm in charge of the comprehensive development plan devises and revises the overall circulation pattern; the physical plant supervises road construction; the grounds division maintains streets, paints lines and places signs; the security office responds to and reports on all accidents; and the safety office works with all these units, primarily by collecting information and making recommendations.

The important information the safety officer collects concerns traffic accidents and their causes. This data comes either from the security officer's report or from the safety supervisor's own investigation. With this material, the safety officer can handle insurance claims involving school vehicles and can help with claims involving other vehicles. He can also maintain an accident visual board--perhaps a simple campus road map with pins to mark sites of serious accidents.

After analyzing this information, he can contribute to the planning process by recommending changes to eliminate or modify danger spots. From his advice might come new speed limits, line paintings, sign placements, speed bumps and special trimming of trees and shrubs near busy intersections and sharp curves.

OCCUPATIONAL SAFETY AND HEALTH ACT

With the enactment by Congress in 1970 of the Occupational Safety and Health Act, basic safety procedures that were previously practiced by a few institutions became mandatory for all. Under provisions of the act, the U.S. Department of Labor establishes standards to be met and provides for their enforcement. As individual states establish standards "at least as effective as that of the federal government," they take over enforcement of the program, but until then the federal government will enforce compliance via financial penalties for cited violations.

Since regional offices have been established and staffed with inspectors who can visit an institution without prior notice, it is wise to set up an adequate safety program well before inspection occurs. Any institution should be able to comply with a minimum of panic and financial pain by following these steps:

Initial Planning

In its special report of March 5, 1973, the National Association of College and University Business Officers recommended a three-pronged approach to initial administrative problems:

1. *Establish a formal framework.* The purpose of this framework is to coordinate all OSHA-related activities within the institution. One individual should be designated resident expert on OSHA regulations to coordinate all compliance activities. He may be the safety and security director or the man appointed to head the total campus safety program.

2. *Draw up short-range and long-range plans for compliance with OSHA.* As soon as the OSHA expert has familiarized himself with the regulations, he can begin to study the campus to identify areas of danger and potential noncompliance. With this information he formulates the sequence and timing of remedial actions that will allow the institution to meet OSHA standards.

3. *Allocate funds.* If the long-range plan is to be effectively implemented, the school must allocate money for these major expenses: (1) equipment and reconstruction necessary to rectify hazards discovered in facilities and working procedures; (2) administrative coordination; (3) potential fines for failures to comply with OSHA regulations.

Records

OSHA requires institutions to keep certain written records and to make them available upon request to the secretaries of Labor and of Health, Education and Welfare. In addition, most states require certain records for Workmen's Compensation Insurance. To eliminate duplicate record keeping, OSHA allows many state forms to be substituted with certain modifications for the specified federal records. These records comprise just one important element of the more extensive record system mentioned earlier.

Inspections

The resident OSHA expert should periodically inspect the premises and buildings to check whether the school is continuing to comply with all OSHA regulations. A checklist is provided in APPENDIX 8-B but it is intended for general guidance only and cannot take the place of systematic analysis of the regulations and their applications to a particular campus.

Corrective Actions

First eliminate the relatively simple problems that require little time and money. For the more complicated problems, the supervisor should prepare realistic estimates of the time and money required and establish deadlines. If an OSHA inspection is probable before remedies can be completed, the supervisor should apply for the appropriate variance through prescribed channels. Otherwise, the school may incur severe financial penalties.

LABORATORY SAFETY

Laboratory safety is technically the most complex safety problem. The larger and more numerous the research programs, the greater and more numerous the safety problems. No one man can be an expert in chemical reactions, radioactive contamination, communicable viruses, behavior of gases, and all other possible laboratory phenomena. For each kind of research and each kind of laboratory, therefore, a separate set of safety rules is needed. Since these could only come from experts in the field, each department should be encouraged to form its own safety committee to draw up and enforce them.

In some cases, a separate laboratory safety officer assists these departmental committees; in other cases, especially at smaller schools, the campus safety officer handles this task.

Departmental Safety Committee

The departmental safety committee should:

1. Draw up and post safety rules appropriate to laboratory procedures and equipment.

2. Inspect laboratories frequently.

3. Analyze new research proposals for potential safety problems.

4. Periodically review safety procedures and revise when appropriate.

5. Arrange accident reporting procedures.

6. Plan, post and arrange practices for fire, emergency and rescue procedures.

Laboratory Safety Officer

In large universities with a heavy research load, the officer may have a staff; at most schools, he works alone; at small schools he may also be the general safety and security director or the physical plant director. His duties:

1. Assist safety committees of research departments.

2. Analyze all plans for building new laboratories or remodeling existing ones.

3. Consult when asked with students, faculty and staff on safety problems pertinent to laboratories.

4. Compile and update a file of reference literature on general laboratory safety and on toxological and radioactive materials.

5. Inspect laboratories frequently for safety and health hazards and for compliance with posted procedures.

6. Select appropriate methods for monitoring laboratory atmospheres for toxic and explosive gases.

7. Inspect laboratory ventilation systems.

8. Arrange appropriate methods for collecting and disposing of radioactive, chemical and other hazardous wastes.

Laboratory Safety Equipment

In addition to specialized safety equipment that particular research programs may require, most laboratories should feature the following devices:

1. Fire extinguishers appropriate to the working conditions, for example, a class D extinguisher for metals and metal hybrids.

2. Safety showers wherever dangerous chemicals, corrosives or biological materials are used.

3. Fire blankets where flammable materials are involved.

4. A first aid kit.

5. An eye wash fountain or eye wash hose.

6. Two widely separated exits.

7. Safe storage areas for dangerous materials located far from the exits.

General Safety Practices

Providing and inspecting this equipment is normally one duty of the safety officer; planning and posting general safety rules in each laboratory is another. What follows are suggestions for such a list:

1. No smoking
2. No horseplay or acts of carelessness.
3. No unauthorized experiemnts.
4. No eating at laboratory benches.
5. No sucking to draw liquids through pipes.
6. No working alone without another person in the immediate area.
7. No bare feet or sandals.
8. Long hair must be confined when a person is working in a laboratory.
9. All injuries must be reported, no matter how minor.

CIVIL DEFENSE

Civil Defense is one additional responsibility usually assigned to the safety office. A civil defense program requires a partnership between the college and the federal government. The Civil Defense Administration establishes procedures, and the college signs a contract with a local civil defense office to provide shelters. The United States Army Engineers then survey the buildings and select those capable of protecting a specified number of people from nuclear attack and the resulting fallout. The Civil Defense Office posts these buildings and later stocks the shelters with water, food and medical supplies.

For its part, the college agrees to appoint a civil defense coordinator, shelter managers, first aid assistants, security officers, and radiological monitoring officers. The college safety officer also provides necessary liaison between the school and the federal agency.

APPENDIX 8-A

NATIONAL
ASSOCIATION OF
FIRE EQUIPMENT
DISTRIBUTORS

PORTABLE FIRE EXTINGUISHER SELECTION CHAR
SHOWING UNDERWRITERS' LABORATORIES
NFPA MAINTENANCE REQUIREMENTS
CLASSIFICATIONS, CHARACTERISTICS

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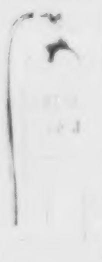
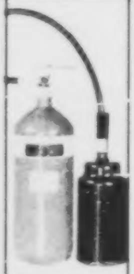
TYPE OF EXTINGUISHER	SPECIAL NOTE:	WATER		LOADED STREAM	CARBON-DIOXIDE	DRY CHEMICAL	
						REGULAR OR ORDINA	
		STORED PRESSURE	PUMP TANK	STORED PRESSURE		STORED PRESSURE*	CARTRID OPERAT
	CARTRIDGE OPERATED (Inverting Type) WATER WATER SODA ACID LOADED STREAM FOAM						
SIZES COMMONLY IN USE (NOMINAL CAPACITY)	NO LONGER MANUFACTURED	2½ Gal.	2½ and 5 Gal.	2½ Gal.★	2½ to 20 lbs.★	2 to 30 lbs.★	4 to 30 lbs.
CLASSIFICATION A		Yes	Yes	Yes	No	No	No
OF B		No	No	Yes	Yes	Yes	Yes
FIRES C		No	No	No	Yes	Yes	Yes
(See explanation at bottom of table). D		No	No	No	No	No	No
EXTINGUISHING AGENT		Water	Water	Alkali-Metal Salt Solution	Carbon Dioxide	Sodium-Bicarbonate Base	
APPROXIMATE HORIZONTAL RANGE		30-40 ft.	30-40 ft.	30-40 ft.★	3 to 8 ft★	5 to 20 ft.★	5 to 20 f
APPROXIMATE DISCHARGE TIME		1 Minute	1 to 2 Minutes	1 Minute★	8 to 30 Sec.★	8 to 25 Sec.★	8 to 25 Sec.★
MINIMUM INSPECTION & MAINTENANCE							
HYDROSTATIC MINIMUM TEST INTERVAL▲	5 Yrs.	5 Yrs.		5 Yrs.	5 Yrs.		
PROTECTION REQUIRED BELOW 40° FAHRENHEIT. No extinguisher can be stored at over 120° Fahrenheit		Yes	Yes	No	No	No	No

A CLASS A fires are fires in ordinary combustible materials, such as wood, cloth, paper, rubber, and many plastics.

B CLASS B fires are fires in flammable liquids, gases, and greases.

* NOTE: CAPACITY OF AGENT IN DISPOSABLE UNITS MAY BE LESS THAN SHOWN UNDER NOMINAL CAPACITY.

▲ NOTE: DISPOSABLE UNITS MUST BE THROWN AWAY AFTER ANY USE.

★ NOTE: ADDITIONAL AGENT CAPACITY, HORIZONTAL RANGE AND DISCHARGE TIME MAY BE AVAILABLE IN WHEELED UNITS.

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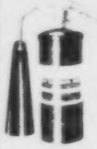
**FIRE
EQUIPMENT
MANUFACTURERS
ASSOCIATION**

DRY CHEMICAL								HALOGENATED AGENTS	DRY POWDER SPECIAL COMPOUND
POTASSIUM BICARBONATE "PURPLE K"		POTASSIUM CHLORIDE KCL		MULTI-PURPOSE "ABC"		POTASSIUM BICARBONATE/UREA			
STORED RESSURE*	CARTRIDGE OPERATED	STORED PRESSURE*	CARTRIDGE OPERATED	STORED PRESSURE*	CARTRIDGE OPERATED	STORED PRESSURE	CARTRIDGE OPERATED		CARTRIDGE OPERATED
									
2 to 30 lbs.*	4 to 30 lbs.*	2 to 30 lbs.*	4 to 30 lbs.*	2 to 30 lbs.*	4 to 30 lbs.*	11 to 23 lbs.*	11 to 23 lbs.*	2⅓ to 5 lbs.	30 lbs.*
No	No	No	No	Yes	Yes	No	No	No	No
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
No	No	No	No	No	No	No	No	No	Yes for specific metals only
Potassium Bicarbonate Base		Potassium Chloride Base		Ammonium Phosphate Base		Potassium Bicarbonate/Urea Base		Halon 1301 & 1211	Sodium Chloride Base
to 20 ft.*	5 to 20 ft.*	5 to 20 ft.*	5 to 20 ft.*	5 to 20 ft.*	5 to 20 ft.*	5 to 30 ft.*	5 to 30 ft.*	4 to 8 ft.	5 to 20 ft.*
8 to 25 Sec.*	8 to 25 Sec.*	8 to 25 Sec.*	8 to 25 Sec.*	8 to 25 Sec.*	8 to 25 Sec.*	20 to 31 Sec.*	20 to 31 Sec.*	8 to 10 Sec.	25 to 30 Sec.*
MONTHLY: Inspection — SEMI-ANNUALLY: Complete maintenance which may include recharging. In certain locations more frequent inspection may be required.									
5 Years on Stainless Steel, or Soldered-Brass Shells. 12 Years on Aluminum, Brazed-Brass or Mild-Steel Shells. (See Para. 1330 on reverse).								12 Yrs.	12 Yrs.
No	No	No	No	No	No	No	No	No	No

CLASS C fires are fires which involve energized electrical equipment where the electrical nonconductivity of the extinguishing media is of importance.

CLASS D fires are fires in combustible metals, such as magnesium, titanium, zirconium, sodium and potassium.

Form No. 1-66—Rev. 4

Additional copies available at a nominal cost from
FEMA, 1803 So. Busse Road, Mount Prospect, Illinois 60056
NAFED, 111 E. Wacker Dr., Chicago, Illinois 60601

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CHECKLIST OF OSHA VIOLATIONS

The following checklist should demonstrate the general emphases of the OSHA program, and perhaps identify general areas of hazard related to institutional facilities and program. It illustrates many of the health and safety points a compliance officer would look for in conducting an on-campus inspection. The checklist was prepared in early 1972 by the Middle Atlantic Region of the Occupational Safety and Health Administration as a tool for guidance in workshops and seminars. It should be used for general guidance alone, and should not serve as a replacement for the systematic analysis of OSHA standards as they relate to specific institutional environments. A satisfactory "score" on the checklist should not forestall the process of becoming completely familiar with OSHA regulations, standards and record keeping requirements.

Walking-Working Surfaces

1. All factory walkways properly marked and cleared. Yes No
2. All office area walkways cleared. Yes No
3. All exterior walkways cleared and in good repair. Yes No
4. All floor holes, floor openings, wall openings and skylights are properly guarded. Yes No
5. Non-slip mats, gratings, false floors and other like materials are in use in wet and other hazardous areas. Yes No
6. All mats, gratings, etc., are in good repair. Yes No
7. Floor openings, hatchways, manholes are properly guarded with covers meeting specifications. Yes No
8. All open sided floors, platforms and runways four ft. or more above ground or floor level are properly guarded with toe boards installed. Yes No
9. All railings and toeboards meet specifications and are in good repair. Yes No
10. All elevated load-bearing floors and roofs are conspicuously posted reflecting safe load limits. Yes No
11. All other load-bearing surfaces (roofs of ovens, crane cab roofs, duck boards, etc.) are properly installed, in good repair, with load capacity clearly marked. Yes No

Stairs and Stairways

1. All stairways (other than fire exits) and elevator and escalator shafts are clear, handrails and/or guardrails provided, treads and risers in good repair with non-slip surfaces and adequate illumination. Yes No

Ladders and Scaffolds

1. All ladders (except fixed and tressel ladders) equipped with safety feet. Yes No
2. All ladders in good condition; wooden ladders maintained unpainted. Yes No
3. Precautions are taken to prevent the use of metal ladders where there is possibility of electrical shock. Yes No

Ventilation

1. All work areas appear to be properly ventilated; no accumulation of smoke, dust, etc., was noted. Yes No
2. Temperature, humidity and air movement in work areas apparently within comfort limits. Yes No

(Page 1 of 5)

APPENDIX 8-B
(continued)

Life Safety

1. Location and easy accessibility of at least two fire emergency exits (minimum requirement) for each work area confirmed with special attention to high hazard area. Yes No
2. Each fire emergency exit is properly marked and illuminated. Yes No
3. Is the route to safety clear and unobstructed from the fire doors? Yes No
4. All fire emergency doors swing in the direction of exit travel. Yes No
5. Fire emergency doors cannot be locked from inside; each is equipped with panic or other simple type of releasing device. Yes No
6. In checking fire alarm system, all post indicator valves examined and opened and sealed; all gravity tanks full. Yes No

Fire Suppression Equipment

1. Does this facility have a volunteer fire brigade? Yes No
2. Are there regular training sessions being conducted? Yes No
3. All portable fire extinguishers are readily accessible, properly located, and show servicing is up-to-date; maximum travel distance for all units not in excess of 75 feet, or 50 feet in hazardous areas. Yes No
4. Each extinguisher has been checked for its adaptability to the hazard presented in the immediate area. Yes No
5. Clearance of 36 in. maintained between sprinkler deflectors and top of stored material. Yes No
6. All fire hoses in proper position and appear to be in good condition. Yes No
7. Where manual fire alarm boxes are used, each is accessible from maximum travel distance of 200 ft., the travel path unencumbered. Yes No
8. Where fire control systems are used which are a hazard in themselves, appropriate warnings of such hazard are posted. Yes No
9. All potential sources of fire and/or explosion from gases, vapors, fumes, dusts, and mists inspected for correctable hazards. Yes No

Electrical Wiring, Apparatus and Equipment

1. Clearly illustrated instructions for resuscitation of persons suffering from electrical shock are posted in all electrical stations, switchboards and transformers; entrance restricted to unauthorized persons. Yes No
2. Procedures for de-energizing electrical circuits reviewed for effectiveness. Yes No
3. Examine extension cords and other temporary wiring for breaks, fraying, or other defects. Yes No
4. All interior wiring systems have grounded conductors continuously identified throughout the plant's electrical system. Yes No
5. Electrical equipment operating between 50 and 600 volts are protected against accidental contact by an approved cabinet or other enclosure. Yes No
6. Insulation mats and protective gear are provided in all areas where more than 150 volts to ground are necessarily exposed within eight ft. from the floor. Yes No
7. Sufficient access and working space is provided and maintained about all electrical equipment for ready and safe operation. Yes No
8. Each electrical outlet box is provided with a cover which effectively protects the hazard from accidental contact. Yes No
9. Inspection reveals instructions for disconnection are attached to each electrical motor and appliance. Yes No
10. All portable electrical tools are equipped with hand-operated switches which are manually held in the closed position; all electrical cables in good condition. Yes No
11. In locations where dust collects on electrical motors causing potential ventilation deficiency, suitable type of enclosed motor is used. Yes No
12. In battery rooms, provision has been made for diffusion of gases to prevent the accumulation of an explosive mixture. Yes No

Industrial Sanitation

1. Toilet facilities meet the following standards:
    - a) Separate facilities are provided for each sex. Yes No
    - b) All are within 200 ft. of the work area where practicable. Yes No
    - c) The number of facilities for each conforms to standard. Yes No
    - d) Toilet rooms are clean, adequately lighted and ventilated. Yes No

2. Dressing rooms, where required, are clean, adequately lighted and equipped with individual clothes facilities. Yes No
3. Lavatories are provided in appropriate numbers with hot and cold water, individual hand towels, and are maintained in good repair; lavatory area is clean and well lighted. Yes No
4. Drinking fountains are installed within 200 ft. of all work areas; they are clean and maintained in good working condition. Yes No
5. Outlets for non-potable water are clearly marked to indicate that the water is not for human use and/or consumption. Yes No
6. There are no cross-connections, open or potential, between a potable and non-potable water supply. Yes No
7. Receptacles for waste are adequate in design and number; they are leak-proof, well maintained and serviced regularly. Yes No

(Page 2 of 5)

Surface Preparation, Finishing and Preservation

1. All spray and dip painting areas are properly shielded, adequately ventilated and well-maintained, equipped with non-explosive electrical equipment. Yes No
2. All dip operations are provided with an automatic fire extinguishing system, adequate first aid supplies and equipment are in immediate area. Yes No
3. All spray booths are of adequate construction with a three-ft. clearance area surrounding each. Yes No
4. Face shields and other protective equipment are provided in steam cleaning operations. Yes No
5. All abrasive blasting areas properly shielded, no evidence of leakage of shot, operators have adequate protective equipment. Yes No
6. All drying equipment is properly controlled, vented and maintained. Yes No

Personal Protective Equipment

1. Adequate protective clothing and equipment is required for all hazardous operations. Yes No
2. All protective clothing and equipment is properly stored for ready use. Yes No

Welding, Cutting, Heating and Brazing

1. All compressed gases are stored and used according to standards. Yes No
2. Welding operations are properly screened. Yes No
3. Fire watchers are designated where required. Yes No

Medical Facilities and Records

1. The dispensary as equipped, the availability of professional or trained personnel, and the maintenance of records conform to corporate minimum standards and are in compliance with OSHA Standards. Yes No

MOST COMMONLY CITED VIOLATIONS

The following list of OSHA standards most often cited for violations was transmitted in a Department of Labor New Release. The department makes such lists public periodically, and the following material represents an update of listings released in October, 1972. Sections of the Occupational Safety and Health Act cited as the basis of alleged violations are listed in descending order. Part 1910 of the Act covers general industry and Part 1926 covers construction standards.

GENERAL INDUSTRY

Section Cited	Subject of Section
1910.309	National Electrical Code
.219	Mechanical power transmission apparatus
.157	Portable fire extinguishers
.212	General requirements for all machines
.213	Woodworking machinery

CONSTRUCTION

Section Cited	Subject of Section
1926.500	Guardrails, handrails, and covers
.451	Scaffolding
.450	Ladders
.350	Gas welding & cutting
.401	Grounding and bonding

(Page 3 of 5)

8 Adequate control over insects, rodents and vermin Yes No

9 The lunch room is adequate in size, clean, well-maintained and physically separated from areas offering the hazard of exposure to toxic materials Yes No

10 All food is properly stored, refrigerated where appropriate, and handled under acceptable sanitary practices Yes No

11 Vending machine areas are maintained in a good sanitary condition Yes No

Material Handling

1 All fiber rope and fiber rope slings used in material handling are in good condition, no evidence of excessive wear or visible defects Yes No

2 All wire rope and wire rope slings are in good condition, no evidence of mechanical damage, bumps, broken strands, or other visible defects Yes No

3 All chain slings, including end fastenings, are in good condition, no evidence of excessive wear or mechanical damage, all are properly stored Yes No

4 Each chain bears a current inspection tag Yes No

5 Repairs to chains are made only under qualified supervision, all are proof tested for load under the prescribed standards Yes No

6 All hooks and rings are being tested before being put into service with records of dates and results of such tests Yes No

7 Inspection of all hooks reveals all in good operation, no visible defects Yes No

8 Shackles are in good repair, no visible defects Yes No

9 Cranes and hoists are in good operating condition, regular schedule for servicing maintained, no visible defects, inspection records properly maintained, proper operating procedures are followed Yes No

10 All industrial trucks are equipped with warning devices, all are equipped with overhead guards Yes No

11 All industrial trucks, other than electrical-powered are refueled only in fire-safe areas specifically designated for that purpose Yes No

12 All L-P gas-powered industrial trucks are properly stored away from underground entrances or elevator shafts to avoid the hazard of explosion Yes No

13 In refueling operations, all engines are stopped, smoking is prohibited Yes No

14. Where electric batteries are recharged, facilities are provided for flushing and neutralizing spilled electrolite, for fire protection, and adequate ventilation is provided for dispersal of gas emanating from batteries Yes No

15 The load capacity is indicated on each truck and is strictly observed Yes No

16 All conveyor systems in good operating order, no visible defects, adequate clearance from aisles and walkways, stopping devices adequate in number and location Yes No

Hand and Portable Powered Tools

1 All hand and portable power tools are in good operating condition, no defects in wiring, equipped with ground wires Yes No

2 All portable equipment is equipped with necessary guarding devices Yes No

3 All compressed air equipment used for cleaning operations is regulated at 30 p.s.i. or less, chip guarding and personal protective equipment is provided Yes No

Machine Guarding and Mechanical Safety

1 Every production machine has been inspected as to the following items, all found to be in satisfactory operating conditions

- a) Cleanliness of machine and area Yes No
- b) Securely attached to floor Yes No
- c) Operations guarded Yes No
- d) Illumination Yes No
- e) Effective cut-off devices Yes No
- f) Noise level Yes No
- g) Adjustment Yes No
- h) Material flow Yes No

Material Hazards

1 All hazardous gases, liquids and other materials are properly labeled and stored Yes No

2 Areas where hazardous materials are in use are fire-safe and restricted to authorized employees Yes No

3 Where x-ray is used, the area is properly shielded and dosimeters are used and processed for all authorized employees Yes No

4 Protective clothing is worn by employees when oxidizing agents are being used Yes No

5 All hazard areas are posted with NO SMOKING signs Yes No

6 All areas where caustics or corrosives are used have been provided adequately with eye fountains and deluge showers Yes No

Material Storage

1 All material is stored so as not to create either a fire hazard or a safety hazard to personnel Yes No

2 All commodities shall be stored, handled and piled with due regard for their fire characteristics Yes No

3. Outside storage of material is maintained at least 15 ft. from an exterior wall Yes No

4 Outside storage areas are in good condition; weeds and grass under control Yes No

APPENDIX 8-B
(continued)

GENERAL INDUSTRY		CONSTRUCTION	
Section Cited	Subject of Section	Section Cited	Subject of Section
.23	Guarding floor and wall openings and holes	.550	Cranes & derricks
.22	General requirements-walking and working surfaces	.25	Housekeeping
.252	Welding, cutting, & brazing	.152	Flammable & combustible liquids
.215	Abrasive wheel machinery	.400	General electrical
.178	Powered industrial trucks	.402	Electrical equipment installation & maintenance
.265	Sawmills	.150	Fire Protection
.37	Means of egress, general	.652	Trenching
.106	Flammable & combustible liquids	.601	Motor vehicles
.141	Sanitation	.100	Head protection
.107	Spray finishing using flammable or combustible liquids	.552	Materials hoists & personnel hoists & elevators
.242	Hand and portable power tools and equipment - general	.50	Medical services & first aid
.176	Handling materials - general	.501	Stairways
.36	General requirements, means of egress	.300	General requirements, hand and power tools
.179	Overhead & gantry cranes	.651	Excavation
.25	Portable wood ladders	.51	Sanitation
.95	Noise exposure	.28	Personal protective equipment
.151	Medical services & first aid	.102	Eye & face protection
.132	Personal protective equipment - general	.302	Power operated hand tools
.133	Eye & face protection	.351	Arc welding & cutting
.27	Fixed ladders	.105	Safety nets

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(Page 5 of 5)

9

PHYSICAL PLANNING, DESIGN and CONSTRUCTION

INTRODUCTION.. 373-375

LONG-RANGE PLANNING.................................. 376-378

PROGRAMMING THE NEW PROJECT.......................... 378-385
- *Figure 9-1: Sample Form for Programming Individual Rooms or All Enclosed Space in Planning a Building*
- *Figure 9-2: Sample Schedule of Architectural and Engineering Fees*

DESIGN PHASE.. 385-390

CONTRACT ADMINISTRATION.............................. 391-405
- *Figure 9-3: Sample Form of Contractor's Qualification Questionnaire*
- *Figure 9-4: Performance Bond Form, American Institute of Architects*
- *Figure 9-5: Payment Bond Form American Institute of Architects*

CONSTRUCTION.. 406-413
- *Figure 9-6: Daily Log of Clerk-of-the-Works*

ACCEPTANCE AND OCCUPANCY.............................. 414-416

APPENDICES:

- *9-A Outline Guide to Preparation of a COMPREHENSIVE PLAN OF CAMPUS DEVELOPMENT...... 417-420*
- *9-B OWNERS DESIGN AND CONSTRUCTION CHECKLIST...... 421-428*
- *9-C Guidelines for a PROGRAM OF ARCHITECTURAL REQUIREMENTS......... 429-431*

9

PHYSICAL PLANNING, DESIGN and CONSTRUCTION

NOT ALL PHYSICAL PLANT DEPARTMENTS participate in new construction, and those that do carry varying degrees of responsibility. Nevertheless, as soon as a new school building "goes on the line," the physical plant department inherits problems--structural, electrical, mechanical or maintenance--the planning, design and construction team failed to solve. For this reason, the department should participate as much as possible in the processes that produce new buildings. At the minimum, plant personnel should advise those who plan, design and build; at the maximum, they should program the building, instruct architects, engineers and consultants, supervise the construction, and inspect final results.

Such work requires trained men with time to spare from on-going maintenance, and small colleges seldom have enough personnel to handle even routine work. A small school, however, can spend millions on new construction, and even a small physical plant staff can help save money or at least aid in spending it more wisely. To make the most of their men and money, physical plant administrators must devise organized approaches to the problems new construction usually brings.

LONG-RANGE PLANNING

COMPREHENSIVE DEVELOPMENT PLAN

Unless school officials agree with Eero Saarinen's contention that a school should grow like a baby--in all directions at once--they should begin with formulation of a Campus Comrehensive Development Plan. Since this kind of long-range projection is frequently called a Master Plan, it should be distinguished from the traditional type of master plan that has long been a popular planning tool on many American campuses. The old fashioned master plan was seldom more than a physical plan, a landscape architect's dream of how to site buildings and shape terrain to create impressive aesthetic effects. Contemporarily, however, the master plan is a complicated compendium of the school's educational philosophy, academic programs, administrative structure, kind and number of students served, rate of growth, and only lastly, the facilities that it will need to accomplish these goals. The physical plan determining when and where a new structure will be built is, therefore, just a major segment of this long-range outline of future academic and physical growth. Refer to APPENDIX 9-A.

It is only after such general guidelines have been established that planners can intelligently tackle the more specific issues that have to be settled before a psychology building, for example, can go on the drawing boards. These issues would include such questions as: How important is training in the sciences? Should a separate science complex be developed? Is psychology a natural or a social science? Will the department have its closest cooperation with sociology and philosophy or with chemistry and biology? Will the department emphasize clinical training or experimental research? Without a comprehensive development plan, school planners cannot properly answer these questions; and without good answers, the architects cannot design an efficient building.

To compile a comprehensive development plan, the school has two options: It can hire an outside firm having total planning capability, or it can do as much work as possible with school personnel. To provide comprehensive planning services, numerous architectural firms have added to their staffs consultants in education, traffic, security and various other areas pertinent to college development. By using such a firm, the school can leave its administrators and instructional personnel free to concentrate on their specialties. Theoretically, it can also obtain from such a company a more objective analysis of the school's problems and potential than its own people might provide. The primary disadvantage to this alternative is the cost: Such specialized companies do not work cheaply. If a college planning committee were to do most of the data gathering, it is probable that the school would still have to hire some outside consultants in order to get the best advice on how to solve its problems.

Given the variety of possible working arrangements, it is essential that school authorities clearly define areas the consulting firm will cover and those staff planners will handle. Given the complexity of comprehensive planning, a careful contract will benefit both parties.

LONG-RANGE PLANNING COMMITTEE

Responsibility for drawing up such a contract and for reviewing and revising the comprehensive development plan should logically fall to a long-range planning committee--the group overseeing planning, and design and construction of new facilities on campus. To function effectively this committee should include representatives from all branches of the academy; at a small institution this could mean the president (usually as chairman), business manager, director of development, director of the physical plant, dean of faculty, dean of students, and a student representative. Each brings some expertise or experience essential to forecasting change. The physical plant director's participation enables the group to utilize records and technical skills of his department.

Drawing up such a plan for a new school is difficult; for an established institution it is doubly so, since the plan must organize a pattern for future growth that will integrate all the mistakes of the past. Although devised at considerable cost, many such plans are half-followed, ignored or soon forgotten in the midst of rapid changes in educational objectives, funding and teaching methods. Since change is the only constant educational planners can rely on, planners must regularly schedule reviews and revisions of the comprehensive development plan; and their hard work will only form one more chapter in the history of campus planning.

Maintaining a comprehensive campus plan is only one function of the long-range planning committee. On most campuses the group also screens requests for new construction and recommends or rejects further exploration. If a project is continued, the committee periodically examines the planning progress and finally makes recommendations to the governing board about the importance of the construction and the best methods for completing it. Once the board gives final approval, the committee reviews final design and actual contraction work, and provides for communication among trustees, administrators, designers, contractors, staff, faculty, students, and local residents.

This last function deserves further comment. To the unitiated, new buildings seem to grow in strange ways and for mysterious reasons. By providing ample explanation about the purposes and progress of a new building, the planning committee can spark more interest in the school's growth--interest that can help recruit and retain able students and faculty. Occasionally, publicity can even produce supplemental funding from unexpected sources within the community and state, especially when the building has uses that can benefit local community or state-wide groups.

PROGRAMMING
THE NEW PROJECT

AD-HOC PLANNING SUBCOMMITTEE

Once the new building has received final approval, the ideal way to proceed is appointment by the president of a special ad-hoc subcommittee to guide the planning for the particular project. At very small schools, the long-range planning committee may have to add this work to its regular load. In that case, however, it should also add--on an interim basis--new members who can give expert advice on the kind of facility. Key people to appoint would be future users of the new structure and those who will maintain it. For an infirmary, the head physician might participate; for a dining hall, the food service director; for a dormitory, the dean of students and representative of resident students. The director of the physical plant or one of his representative should serve on all such committees.

The basic purposes of this subcommittee are to clarify needs the new structure must satisfy and to explore in a preliminary way possible designs to solve problems the needs create. For a dormitory, for example, the group should obtain input from resident students, counselors, and physical plant personnel who will maintain and operate the building. Statements regarding recommended changes should be submitted in writing with an accompanying rationale. At this stage, physical plant personnel would provide necessary technical data about the site and utilities; at a later stage, they would also evaluate various structural, electrical and mechanical systems recommended by the designers.

To supplement this information, selected members of the ad-hoc subcommittee might visit recently built facilities similar to the one they are planning. Such visits and interviews with other campus planners are highly recommended by the Association of Physical Plant Administrators because they bring new ideas into the planning process and provide the subcommittee with concrete examples of what to imitate and what to avoid.

PROGRAM OF ARCHITECTURAL REQUIREMENTS

The end result of this work should be a written Program of Architectural Requirements. Althougn many schools work with fairly informal programs often consisting of typed minutes from planning conferences, such informal records are seldom as effective as formal programs. The latter document helps architects and engineers by providing three kinds of essential information. From the Comprehensive Development Plan, the program draws general guidelines concerning the school's educational philosophy, academic and research functions, student mix, etc. From the material the subcommittee accumulates, the program presents a list of specific features desired for the particular building under design. Figure 9-1 is a form which has been found very effective for the layman to describe all of the requirements in a specific room or other enclosed space. Laymen should be discouraged from preparing drawings. From the technical information the physical plant collects about the campus, the program selects data pertinent to the particular project, including information about utilities locations, electrical characteristics, test borings, etc. Refer to APPENDIX 9-B, Owners Design and Construction Checklist and APPENDIX 9-C, Guidelines for preparing a Program of Architectural Requirements. Completion of the architectural program is not the end of the subcommittee's job. After architects and engineers have been hired, it will continue to work closely with them through to the completion of working drawings and specifications.

SELECTION OF ARCHITECTS AND ENGINEERS

The difficult chore of choosing principal designers usually reverts to the general planning committee, the president, or the school's governing board. Because selection procedures vary widely it is difficult to generalize about this step, except to note that it is one of the most important stages in the planning, design and construction process. On the work of the architects and engineers will largely depend the final appearance, efficiency and cost of the building, as well as the continuing expense of regular operation and maintenance. Their selection, therefore, should be done with care and delicacy. Complicating the process is a national professional policy for designers that regard as unethical the low-bid award system normally used to choose a building contractor. As a result, political connections and personal friendships can unduly affect the choice--especially of the architect. There are ways to ascertain expertise, however, and schools that follow them need not be saddled with an incompetent architect or engineer.

One method the American Institute of Architects recommends for determining competence is a design competition. Frequently used for large-scale civic projects, this option usually requires too much time and money to be practical for small colleges and universities. Officials at these institutions must resort instead to analysis of the job requirement and capabilities of local architects.

The most important qualities to look for in a professional designer are personal integrity and technical competence, with the former being the most difficult to define and discover. The intangible traits that constitute a person's character--honesty of purpose, sense of responsibility and sound judgment--will be especially important for the architect because his decisions will virtually control the design and construction phases, and because there are many places where he can slow or foul up the project. If he fails to conceive the proper solution, if he neglects to review the work of his engineers, if he does not supervise the contractor carefully, his client--the school--will suffer. Other prerequisites are more measurable. Technical competence, as well as practical efficiency and business acumen, will reveal themselves in his past work and his present operations.

Project Title and Location

Floor Number ____ Room Number and Title ____ Date ____

Size of Space ____ Occupant/Committee Representative and Tele. No. ____ Type of Space ____

FUNCTION OF SPACE ____

SPECIAL REQUIREMENTS ____

ROOM FINISHES

Walls ____
Ceilings ____
Floor ____
Base ____
Lighting Level ____
Other ____

UTILITIES REQUIRED

Gas . . . . ☐
Air . . . . ☐
Hot Water . . . . . ☐
Cold Water . . . . . ☐
Steam . . . . ☐
Distilled Water . . . . . ☐
Vacuum . . . . ☐
110 Volt Elec. . . . . . . ☐
208 Volt Elec. . . . . . . ☐
Telephone . . . . ☐
Other ____ ☐

BUILT-IN EQUIPMENT ____

MOVABLE EQUIPMENT

Desk-Executive. . . . . . ☐
Desk-Typical . . . . ☐
Desk-Secretarial . . . . . ☐
Desk-Special . . . . ☐
Chair-Exec. . . . . ☐
Chair-Swivel. . . . . ☐
Chair-Sec. . . . . ☐
Chair-Occasional . . . . . ☐
Files-Vertical . . . . . . ☐
Files-Horizontal . . . . . ☐
Table-Utility . . . . ☐
Table-Occasional . . . . ☐
Credenza . . . . . . ☐
Waste Can . . . . . . ☐
Shelf Unit . . . . . . ☐
Lamp . . . . ☐
☐ Other ____

REMARKS ____

SAMPLE FORM FOR PROGRAMMING INDIVIDUAL ROOMS OR
ALL ENCLOSED SPACE IN PLANNING A BUILDING

Figure 9-1.

Page ____

For evidence of general competence, school planners can examine any similar buildings he has designed and interview those who occupy and maintain them. For additional recommendations, they can investigate his standing in his field: Has he attained the AIA designation? Is he highly regarded by his peers? To evaluate his facilities and staff, they can visit his office and talk with the person designated project architect. The best evidence of a man's character and competence, of course, comes from previous work done for the school, and many institutions make it a point to retain those who have performed well for them in the past.

Another reason selection of the architect is so important is that he traditionally selects the engineers. This practice is dictated by efficiency: If an architect knows his business, he also knows which engineers are capable and which he can work with effectively. The architect must, however, submit his recommendations to the school for approval, and in some cases the college will ask for a different set of engineers. In both cases, the architect directs the engineer's work and pays them out of his fees.

Fees

Once the architect is chosen, the parties should sign a contract spelling out such details as assistance the school will render, services the architect will provide, and remuneration he will receive. Most architectural contracts are modifications of a standard model recommended by the AIA, and most architectural fees conform either to the scale established by the AIA or to a scale established by a local political subdivision for work done at institutions under its control. See Figure 9-2 for a typical state scale. Both schedules are based primarily on cost of the construction with some consideration given to the relative simplicity or complexity of the particular building type. On most projects, the architect receives approximately 6% of the total cost for his services through the design and construction stages. Out of this percentage he will pay his engineers a negotiated percentage of the construction cost for the portion they designed. An electrical engineer, for example, might receive 4% of the $400,000 spent on the electrical system of a building.

The school parcels out all money to the architect according to a schedule agreed upon in advance. A typical arrangement might be:

Phase 1. SCHEMATIC DESIGN.......................10% of the total fee
Phase 2. DESIGN DEVELOPMENT.....................15% of the total fee
Phase 3. WORKING DRAWINGS AND SPECIFICATIONS....50% of the total fee
Phase 4. SUPERVISION OF CONSTRUCTION............25% of the total fee

SAMPLE SCHEDULE

OF

ARCHITECTURAL AND ENGINEERING FEES

TYPE A*

Work of simplest type such as Warehouses, Garages, Farm Buildings, and Road, Sewer and Water Distribution projects of simpler nature and similar type work.

Under	
$ 50,000	6.0%
$ 50,000 – 100,000	5.5%
$ 100,000 – 200,000	5.0%
$ 200,000 – 500,000	4.5%
$ 500,000 – 1,000,000	4.25%
$1,000,000 – 2,000,000	4.0%
Over $2,000,000	3.5%

TYPE B

Conventional character such as Apartment Buildings, Schools, Single Residences, Office Buildings, Ordinary Institutional Water and Sewage Treatment Plants, Power Plants, Incinerators, more complex Road, Sewer and Water Distribution projects, and the like.

7.0% on first $100,000
6.5% on second and third $100,000
6.0% on fourth and fifth $100,000
5.5% on amounts over $500,000 to $1,000,000
5.0% on amounts over $1,000,000 to $2,000,000
4.5% on all amounts over $2,000,000

TYPE C*

Highly specialized work, complicated alterations, very small jobs, etc.

Under –	
$ 50,000	10.0%
$ 50,000 – 100,000	9.5%
$ 100,000 – 200,000	9.0%
$ 200,000 – 500,000	8.0%
$ 500,000 – 1,000,000	7.5%
$1,000,000 – 2,000,000	7.0%
Over $2,000,000	6.5%

TYPE D

Duplicate Structures

Flat 3.0% negotiated adjusment permissible if so-called duplicate structure has more than elementary design changes.

*Approved change orders whichincreasecost of project to higher bracket shall not change % of payment for original contract.

Figure 9-2.

A less widely used system is one based on hourly rates for the architect, his designers, draftsmen, specification writers, and special consultants (more about them later). This charge usually includes a markup for overhead and requires separate billing for out-of-pocket expenses such as travel, long-distance telephone calls, and blueprints. Under both arrangements, if the client decides to terminate the project or the architect, he pays for services actually rendered to that point with a nominal amount added to cover the architect's final expenses.

DESIGN PHASE

It is primarily the architects and engineers who carry a project through the design stage. They will definitely need considerable assistance from the ad-hoc planning subcommittee, and they may have to invite special consultants to help solve complicated problems, but they will still shoulder the bulk of the design burden until the job is ready for bidding. The architects will begin by creating the unifying conception; next the engineers will devise systems to fit this format; and then the project architect will coordinate their drawings. During this phase, the role of the physical plant department should be continual review--frequent checking and rechecking of drawings to catch design errors and omissions. In essence, the process requires planners to explore all options, develop concepts and costs, and then refine, correct, and coordinate all drawings and estimates as necessary.

The following outline gives a more detailed overview of the major steps in the design process.

PHASE I. SCHEMATIC DESIGN

A. Conferences with the planning subcommittee to clarify the scope of the project and to discuss special problems.

B. Preparation of small-scale schematic drawings followed by review and revision to meet the school's approval.

C. Incorporation of codes, standards, and regulations of controlling governmental agencies followed by preliminary review by these agencies.

D. Outline of specifications of materials and systems, particularly of mechanical and electrical systems. This might include alternate concepts of systems design accompanied by an economic evaluation of initial costs and operating and maintenance costs.

E. "Ballpark" cost estimates and probably project schedule.

PHASE II. DESIGN DEVELOPMENT

A. Restudy of design accompanied by preparation of dimensional drawings with some detail at a large scale.

B. Elimination of alternates and preparation of more detailed specifications.

C. Second review of plans by governing agencies.

D. Revision of "ballpark" estimates.

PHASE III. WORKING DRAWINGS AND SPECIFICATIONS

A. Development of final drawings, details and specifications required for competitive bidding and construction.

B. Coordination of drawings and specifications for all trades to avoid conflicts during construction.

C. Final approval by the college's decision-making authorities and establishment of a cutoff date for further revisions or changes in the plans.

D. Final review by local and state authorities with jurisdiction.

E. Revision of cost estimates based on final documents. Although costs cannot be guaranteed to the letter, some design contracts are written to require that the design be within a prescribed range--plus or minus five percent of the budgeted figure.

F. Preparation of owner-contractor agreement for review by the college attorney.

G. Provision of required sets of drawings for bidding and construction contract.

Certain aspects of this design process require further explanation.

CONSULTANTS

At a very early stage, the architects and engineers may find it necessary to add outside consultants to help solve especially complicated problems in specialties such as audo-visual equipment, interior design, food service, and landscape architecture. Before doing so, the principal designers would interview the consultant, brief him on his responsibilities, and request a memorandum spelling out in detail what services he will provide and what price he will charge. As client, the college rather than the architect would have final approval of any consultants added to the design team. If the specialist is approved, he would then sign a contract, attend all coordinating conferences, and prepare plans that coincide with those of the architects and engineers.

COORDINATION

With many experts working on the same project, close coordination becomes exceedingly important. As the architect slowly moves the project from schematic drawings through revisions toward final working drawings, he should bring his engineers and consultants together for frequent coordinating conferences with the college planning team. At these meetings, the designers should clearly explain not only the concepts and systems they favor, but also alternatives available. The ad-hoc subcommittee needs such detailed information from the designers in order to function responsibly. Architects and engineers, in turn, need firm decisions from the college planners as early as possible in order to perform expeditiously and efficiently. If these meetings can rapidly resolve even fairly simple matters like laboratory layouts and furniture placement, they can speed the process considerably--in the case of a laboratory by showing consulting engineers where to place lights, electrical outlets, piped connections and telephones. If a builder has been selected early through some kind of negotiated contract, his representative should also be brought into the planning process to advise on possible construction problems. These conferences also stimulate interest and a greater sense of cooperation among the college planners who have the opportunity to improve upon their original conceptions or to find out why they cannot be altered.

During these coordinating conferences, the physical plant representatives plays the vital role of intermediary between academic (or administrative) planners and professional designers. For the foreign language professor who wants an electronic laboratory, he can interpret the esoteric engineering vocabulary and explain problems and potential of modern construction methods. For the architects and engineers, he can clarify exactly what the academician needs. In most cases, an architect experienced in educational design will be able to communicate effectively with faculty and administrators, but the physical plant representative should remain alert to signs of misunderstanding, lest a teacher or architect agree to something only half understood. Such confusions will inevitably result in late, expensive change orders or in disappointment.

REVIEW

Physical plant staff can play an even more important role during the frequent plan reviews. At each important design stage, the physical plant director should require his operations and maintenance chiefs to examine the plans. They are the people who will have to live with the completed structure; they should be able to suggest design changes that will simplify operation and maintenance and thus reduce the building's continuing costs. Architects have been known to work up complete sets of drawings for large, complex buildings without including janitors' closets with sinks or sufficient storage areas.

A thorough plan review will also cover code compliance. Although good architects will be on top of most pertinent codes, even the best can make a mistake--especially in an era of proliferating legislation related to health, safety and environmental protection. Any experienced designer will be familiar with traditional state and federal building codes, many of which are modeled on codes drawn up by the Building Officials Conference of America (BOCA) and by the National Fire Protection Agency. In the last decade, however, many states have been adopting multifarious federal codes relating to occupational safety, environmental protection, and designing for handicapped people. To cite a few examples of these new regulations, architects and engineers must plan easy access for the handicapped, guardrailings for tradesmen, controls for sediment runoff, and low emissions for the heating systems. These leave considerable room for accidental omissions which can later bring change orders or lawsuits. Catching mistakes early is another job for physical plant staff. As mentioned earlier, not all physical plant departments enjoy plan review privileges, but given its importance, all should ask for it.

SPECIFICATIONS

Another important and complicated step is preparation of final specifications. Although the architect is in charge of this task, school officials still need to work closely with him through this stage and carefully review his work. The first question the client and architect must answer together is which types of specifications would be most appropriate for the building? According to the widely used MANUAL OF PRACTICE published by the Construction Specifications Institute, Inc., 1150 Seventeenth Street, N. W., Washington, D. C. 20036, five methods for specifying construction products are:

1. Descriptive Specifications which list in detail the exact characteristics desired in the product.

2. Proprietary Specifications which allow the client to better control quality levels by requiring brand name products (more about this later).

3. Reference Standards which stipulate that the products must meet quality levels established and published by authorities and testing institutes such as the American Society for Testing Materials and the National Fire Protection Agency.

4. Performance Specifications which simply require that the product accomplish certain functions (i.e., the ventilating system must change the air throughout the building five times per hour).

5. Cash Allowances which are actually a tactical maneuver to delay a specification decision.

Proprietary specifications can be a problem under competitive bidding, because they eliminate competition by naming the brand to be used. As a result, they are usually prohibited on work done at public institutions or with public money. Sometimes they are necessary: Even state and federal projects may have to specify products by name in cases where new material must match existing materials in quality and size or where new equipment must connect or mesh with systems previously installed.

In addition to instructing the architect about types of specifications to be used, the college should also provide a technical and legal review of his work. Technical review is advisable because many architects rely heavily on manufacturing companies for help with the onerous task of writing specifications. Most elevator firms, for example, would happily provide an architect with a free set of elevator specifications which the designer can simply modify and submit to his client. The problem with this method arises under competitive bidding. In such a case, the physical plant director should examine the documents to insure that the specifications are not so restrictive that they eliminate all products except those supplied by the assisting company.

The college counsel should provide legal review of nontechnical portions of the General and Supplementary Conditions before the school gives final approval. Sections of particular legal import include: insurance coverage and its relation to the institution's overall insurance program, conditions for release of liens, guarantees, and performance and payment bonds.

Although movable furniture and fixed furnishings for laboratories, libraries, physical education buildings, kitchens, etc., require specifications, they are usually excluded from the general contract. The college purchasing agent will handle this chore by working closely with the architect during specification preparation, bid period and installation.

CONTRACT ADMINISTRATION

SELECTION OF CONTRACTORS

Although written documents are important, they can never protect the unwary from the unscrupulous, especially in a human activity as complicated as construction. A list of reliable contractors, therefore, becomes as important to a college as a set of comprehensive specifications. To compile this list, physical plant administrators can query architects and former clients of local firms, visit job sites and offices, and evaluate personnel and financial stability. As with architects and engineers, the important qualities are honesty and integrity. No contractor will be an altruist, but some show more respect for the spirit of agreements they make. Since the company will have to expend a considerable amount before it receives an initial payment, its financial stability is also an important qualification.

In their investigations, staff personnel should ask questions about contractors and subcontractors under consideration such as:

Are they basically honest?
Do they have the interests of the college at heart?
Are they meticulous about quality?
What is their financial standing?
How long have they been in business?
What is their reputation in the community?
Do they take timetables seriously?
Are their charges for change orders fair?
Do they work well with architects and clerks-of-the-works?
How experienced is the construction superintendent they intend to appoint to the job?
Do they live up to guarantees in the contract?
Were they prompt in solving problems during the one-year guarantee period?

The most important question is: "Would you invite this contractor to bid your next project?

To aid the investigation, contractors should provide the following information:

1. Current financial statement.
2. Schedule of projects currently under contract, a list of those completed within the last five years, an estimate of their value, and names and addresses of clients and architects involved.
3. Statement of experience with projects similar to this one.
4. The number, names and qualifications of supervisors to be assigned to the job.
5. Name of his bonding company.

To streamline this process, the physical plant department could develop a standard "Contractor's Application for Prequalification" similar to the one shown in Figure 9-3. The form should produce a complete record of experience, capabilities, organization and financial condition of every company that applies.

BIDDING VERSUS NEGOTIATION

With some important exceptions, the most economical construction contracts are those awarded through competitive bidding procedures. This mechanism works to reduce costs by forcing contractors to underbid each other to get a job. To insure economy and reduce graft and favoritism, most federal and state agencies usually require competition on all projects that they fund. On occasion, however, private and even public colleges may find it less expensive to negotiate a construction contract with only one company. One reason for this unexpected saving is that competitive bidding requires preparation of a number of detailed documents and drawings that could be eliminated if the contractor can show planners, engineers and architects how to design for more economical construction and, in the process, help reduce the number of expensive change orders. Certain procedures and precautions are essential with each method.

Figure 5-2.

SAMPLE FORM
CONTRACTOR'S QUALIFICATION QUESTIONNAIRE FOR CONSTRUCTION PROJECTS

Name & Address of Your Bonding Company: ______________________________
____

Encircle Type Shop: Union Non-union Open Shop

IMPORTANT

This questionnaire is intended as a basis for establishing the qualifications of Contractors for undertaking Construction, Maintenance and Repair Work under the jurisdiction of the ______________________________ Institution. If a Contractor has not filled in such a questionnaire and turned it over to the Director of the Physical Plant, setting forth his qualifications to the satisfaction of the Director of the Physical Plant, the Contractor shall be ineligible to receive drawings and specifications for bidding or for contract award for such work as may be handled through the Department of the Physical Plant. Certification of Qualifications will be valid for one calendar year only, and renewal must be applied for before January first of each succeeding calendar year.

I. GENERAL

Legal Title & Address of Organization ______________________________

Local Representative's Name, Title & Address ______________________________

Encircle Type of Ownership: Corporation Copartnership Individual
Year in Which Organized: __________ __________ __________

Name(s) of Principal Officers, Partners, or Proprietor: ______________
____

List major items of equipment fully owned by organization, with approximate value and age. If not fully owned, so state.)

Give name and data about any construction projects you have failed to complete: ______________________________

Has your organization ever been party to any criminal litigation as a result of construction methods, costs, etc? ____ If, yes, explain: ____
____

II. FINANCIAL

Give value of all construction equipment fully owned by your organization: ______________________________

Value of total assets of organization including equipment value above: ______________________ Value of total liabilities: ______________

Total contract value of work accomplished by your organization in each of the last 3 years: ______________________19___; ______________
______________________19___; ______________________19___.

Contract value of work presently being accomplished by, or pending award to your organization ______________________________

Value of liens or judgments outstanding aginst your organization:
____

Has any bonding company refused to write a bond on any construction work? ____________ If yes, explain: ______________________

What is maximum value of contract work for which you could obtain bond? ______________________________

Other pertinent information: ______________________________
____
____

Figure 8-8 (Reverse side).

III. Attach separate sheets where necessary.

(Indicate type of contracting you have undertaken and years of
E (experience: [General and/or Sub] ______________________________
(____

X (State construction experience of principal members of your
(organization: [Give name of member; years of experience; type of work;
P (in what capacity as foreman, supervisor, etc.; and any special quali-
(fications of member as Registered Engineer, Surveyor, etc.]
E (____
(____

R (List some principal projects completed by your organization giving
(name of project; if general or sub, and type of work; contract amount;
I (year; designing architect/engineer; and owners' names and addresses.
(____
E (____

(If you are a General Contractor, list some subcontractors in various
N (fields who have worked under you; or if you are a Subcontractor, list
(some general contractors for whom you have worked: ____________
C (____

(What is the money value of the largest project accomplished by your
E (organization? ____
(Maximum value in last 3 years: __________________________________
(Maximum value you prefer to undertake: ___________________________
(Price range of work your organization is deemed best adapted to
(undertake: ____
(
(Is your organization licensed in the State of ______________ for
(the current year? ____

These statements are certified to be true and accurate.

Dated at ____________________ this ______ day of ____________ 19 __

By ______________________________

Title ______________________________

Organization ______________________________

State of ____________________

County of ____________________, S.S.

____________________ Being duly sworn states that he is

____________________ of ____________________

Office Organization

and that the answers to the foregoing questions and all statements therein contained are true and correct.

Sworn to before me this ____________ day of ____________________ 19 __

Notary Public ______________________________

My commission
expires ____________

Bidding Documents

If the school commits itself to a competitive award, its architect must prepare certain documents, review them with the college business manager and attorney and provide each invited contractor with three sets. A set of bidding documents will usually include the following:

1. Working drawings.
2. Specifications that include general and supplementary conditions.
3. A bid proposal form that includes spaces for total cost, breakdown by trades, any alternate and unit prices requested, and time needed for completion.
4. A bid bond the contractor signs and returns with a deposit as a guarantee that if he wins the award he will perform. If he does not, he forfeits the deposit.
5. Performance bond--this is signed at the contract settlement and insures that if the contractor is unable to complete the job, his bonding company will.
6. Payment bond--often combined with the performance bond, this document insures that all the subcontractors will be paid.

Refer to Figures 9-4 and 9-5 for AIA recommended forms of performance and payment bonds.

The school usually requires a refundable deposit for the loan of these bidding documents; if the contractor wishes additional copies, he purchases them outright. In addition, single sets of the drawings and specifications should be on file at the physical plant director's office, architect's office, and the local F. W. Dodge office. These sets are for review by suppliers and subcontractors.

Bidding Procedures

To make the bidding competitive, the school should invite at least three contractors, but authorities disagree about the wisdom of inviting many bidders. Even though the invited bidders have been prequalified, the danger exists that some better companies may not risk the costs involved in preparing bids when a large number of bidders has lowered their probability of winning. The physical plant director should keep informed of local conditions before recommending how many contractors to invite. If he knows which companies are already committed to their full capacity, he can draw up a list that is realistic and competitive. In some public institutions public advertisement on capital projects is a requisite.

Which type bid will produce the best quality is another unresolved question. The traditional system calls for one general contractor to submit one total price for the entire project (with a few alternates separately priced to allow some leeway for negotiation and change) and then to act as coordinator for the work which he performs, as well as that done by subcontractors. One advantage of this method is simplified administration; the contract establishes clear lines of authority running from the school through the architect to the general contractor, subcontractors, suppliers, tradesmen and laborers. This arrangement also provides single responsibility through the guarantees that follow completion of the job.

In recent years, however, the growing complexity of structural, mechanical and electrical systems has popularized the multibid method in which as many as three to five different subcontractors are awarded separate contracts for distinct portions of the job. Proponents claim that the multibid method allows the client to eliminate the general contractor's profit on certain complex jobs too technical for him to administer efficiently. General contractors claim that coordination and speed suffer as responsibility is dispersed. Since some coordination work will always be necessary, schools that use multibids will have to pay a staff member to supervise or award their architects an additional fee to handle this chore. In deciding this issue, the physical plant director's knowledge of the capabilities and reliability of local contractors and subcontractors is extremely important.

Figure 8-4.

THE AMERICAN INSTITUTE OF ARCHITECTS

AIA Document A311

Performance Bond

KNOW ALL MEN BY THESE PRESENTS: that

(Here insert full name and address or legal title of Contractor)

as Principal, hereinafter called Contractor, and,

(Here insert full name and address or legal title of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto

(Here insert full name and address or legal title of Owner)

as Obligee, hereinafter called Owner, in the amount of

Dollars ($

for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators successors and assigns, jointly and severally, firmly by these presents.

WHEREAS,

Contractor has by written agreement dated 19 , entered into a contract with Owner for

in accordance with Drawings and Specifications prepared by

(Here insert full name and address or legal title of Architect)

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

Figure 9-4 (Reverse side).

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the Owner.

Whenever Contractor shall be, and declared by Owner to be in default under the Contract, the Owner having performed Owner's obligations thereunder, the Surety may promptly remedy the default, or shall promptly

1) Complete the Contract in accordance with its terms and conditions, or

2) Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, or, if the Owner elects, upon determination by the Owner and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and Owner, and make available as Work progresses (even though there should be a default or a succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the contract price," as used in this paragraph, shall mean the total amount payable by Owner to Contractor under the Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.

Any suit under this bond must be instituted before the expiration of two (2) years from the date on which final payment under the Contract falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators or successors of the Owner.

Signed and sealed this day of 19

(Principal) (Seal)

(Witness)

(Title)

(Surety) (Seal)

(Witness)

(Title)

Figure 9-5.

THE AMERICAN INSTITUTE OF ARCHITECTS

~~AIA Document A311~~

Labor and Material Payment Bond

THIS BOND IS ISSUED SIMULTANEOUSLY WITH PERFORMANCE BOND IN FAVOR OF THE OWNER CONDITIONED ON THE FULL AND FAITHFUL PERFORMANCE OF THE CONTRACT

KNOW ALL MEN BY THESE PRESENTS: that

(Here insert full name and address or legal title of Contractor)

as Principal, hereinafter called Principal, and,

(Here insert full name and address or legal title of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto

(Here insert full name and address or legal title of Owner)

as Obligee, hereinafter called Owner, for the use and benefit of claimants as hereinbelow defined, in the amount of

(Here insert a sum equal to at least one-half of the contract price) Dollars ($),

for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS,

Principal has by written agreement dated 19 , entered into a contract with Owner for

in accordance with Drawings and Specifications prepared by

(Here insert full name and address or legal title of Architect)

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

Figure 9-5 (Reverse side).

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

1. A claimant is defined as one having a direct contract with the Principal or with a Subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.

2. The above named Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expenses of any such suit.

3. No suit or action shall be commenced hereunder by any claimant:

a) Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to any two of the following: the Principal, the Owner, or the Surety above named, within ninety (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Principal, Owner or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.

b) After the expiration of one (1) year following the date on which Principal ceased Work on said Contract, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

c) Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the Project, or any part thereof, is situated, or in the United States District Court for the district in which the Project, or any part thereof, is situated, and not elsewhere.

4. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

Signed and sealed this   day of   19

(Principal) (Seal)

(Witness)

(Title)

(Surety) (Seal)

(Witness)

(Title)

Information about the local construction picture will also affect the bidding time, as will the magnitude and complexity of the particular job. Even in a slow season, two weeks is the minimum time contractors should have to prepare bids; if many similar jobs are out for bid at the same time, a month might be appropriate. The goal is to elicit the least expensive, most realistic bid. If a company wins a contract because of a hurried and incomplete estimate, both the contractor and the client are probably in for trouble.

Due dates and delivery spots should be specified in the bid invitation and adhered to strictly. The best days to receive bids are Tuesdays, Wednesdays, and Thursdays; the worst are Mondays, Fridays, and days before holidays. A 2:00 p.m. deadline is most practical since it leaves the mornings open for last-day mail service and last-minute hand deliveries of various quotations.

The bids should be opened and read in the presence of all bidders who wish to attend. Private bid openings attended only by the college representatives and the architect are sometimes held, but always at the risk of damaged reputations. In either case, the architect should prepare a tabulation of all bids and distribute it to all bidders.

Bidding Problems

Although the essence of competitive bidding requires that the low bidder receive the contract, the award is never automatic nor immediate. Before announcing the final decision, the architect, and the owner's representative should analyze all bids for the best combination of alternates and for certain danger signs. One of the latter is a dramatically cheap price. Since most bids in a competitive market will normally fall within a 10% total range, a contractor who has undercut the nearest opposition by more than 10% either has developed a particularly efficient method or has made a serious mistake. If the former is the case, he should win the contract; if the latter is true, he may cause problems by trying to recoup for his estimating error by skimping on quality or overcharging for change orders. For these reasons, the college, especially if it is private, may decide to choose a higher bidder whom it considers more reliable.

Such a move should only be tried in rare cases and with good reason, because it brings with it a set of special headaches. Once a college, even a private one, has advertised for public bids, it has created a good faith situation and possible grounds for a suit should it violate the letter of its bid invitation. The discarded bidder might sue to enjoin the award or at least to recover the cost of preparing his bid. Most college construction today has public money in it somewhere, and this usually requires a low-bid award to a qualified contractor. In addition, any short-term benefits to rejecting the low-bid award may be eventually negated by the deterioration of the competitive market. If one contractor consistently bids low and loses, he will soon cease bidding with the school, a situation sure to encourage higher bids on the part of the other contractors.

NEGOTIATIONS

It was mentioned earlier that schools not bound to use competitive bidding might occasionally find it more appropriate to negotiate with one general contractor or with several subcontractors. The advantages can include greater speed, economy and quality; if the contract is not carefully administered, the disadvantages can include loss of the same. The key is selecting honest, reliable firms; the major contract types are:

1. Guaranteed Maximum. Also known as Construction Management, this system requires the school to pick up the actual cost of labor and materials and to reimburse the contractor for managing the project. The builder, in turn, guarantees that labor and materials' expense will not exceed an agreed-upon maximum. He receives his management fee in one of two ways:
    a. Fixed Fee. As the name suggests, this method provides a flat sum for the contractor, thus encouraging him to finish the job within, or ahead of, schedule.
    b. Percentage. The contractor agrees to work for a specified percentage of the guaranteed maximum cost; in many cases the college also agrees to share any savings with the contractor in order to inspire the builder to bring the project in under cost.

2. Cost-Plus. This arrangement is similar to the first, with one significant difference. The builder receives a percentage of the actual construction costs, but without the guaranteed maximum sum, he no longer has a strong incentive to economize.

3. Owner-Builder. Under this set-up, the school authorizes its physical plant director to act as general contractor, and designates an experienced staff member to act as construction supervisor. Such a system allows the school to deal directly with subcontractors and to eliminate the general contractor's overhead and profit percentage. Since it also puts a large time and energy demand on the physical plant staff, it should only be attempted when the department has an experienced supervisor on hand and when arrangements have been made to reimburse the physical plant department for his time.

Speed of construction is the primary advantage to a negotiated contract. By reaching an agreement with a builder, the college can eliminate both the two-to-four week bidding period and the one-to-two weeks required for bid analysis. On some projects the process can be further speeded by the "Fast Tracking Method" in which the contractor begins foundation work before the detailed working plans for the later stages of the structure have been drawn.

Economy can result from this time saving and from the close liaison the builder establishes with planners, architects and engineers early in the design stage. By attending many of the coordinating conferences, the contractor or his representative can suggest plan changes or design tricks that may later save construction time and money. One theory holds that additional savings may result because subcontractors who are assured of the job can order materials earlier--possibly at cheaper prices. Hopefully, the speed and economies will result in more construction money going into quality work.

CHANGE ORDERS

Throughout this chapter the importance of avoiding change orders has been emphasized. At this point it would be appropriate to explain why change orders are inevitable and to suggest how the owner might mitigate their effects. Changes are inevitable for two reasons--mistakes and improvements. Unfortunately, the former are more frequent; of the principal participants, the owner usually suffers most whether changes result either in additional or reduced costs. This is because there are only two parties to a construction agreement--the owner and the builder. If the architect or engineer makes a mistake, every effort should be made for them to accept responsibility and any costs related to the design error. In this day, professional designers normally carry insurance. If the builder fails to perform properly, he can quickly rectify the error with only small inroads into his profit margin. For the owner, however, change orders mean delay and greater cost because of redesign, estimating extra construction, and perhaps even refinancing. Such delays cost dearly after a building is already into brick and stone, but there are ways to mitigate the pain.

The most common causes of changes are:

1. Errors of Commission. These develop from design mistakes which make further construction or installation according to the original plans impractical. A draftsman's slip can mean the wrong thickness for steel members or pipe fittings. An engineer's oversight can plan an electrical conduit in the same location as an airconditioning duct.

2. Errors of Omission. The designers may leave gaps in their plans, for example, forgetting access panels for utility systems or safety hooks for upper floor windows.

3. Substitutions. After construction commences, planners may find some newly developed materials or equipment more suitable for the building. Since the contract specified a different product, such an improvement would usually necessitate a change order.

4. Changes in Scope. Once the facility begins to take definite shape, academic or administrative planners who had trouble visualizing the final appearance from drawings may decide they need more room. Additional monies may unexpectedly become available for expansion, or inflation and other change orders may exhaust available funds, necessitating drastic reductions in the size or quality of construction.

The best way to control the number of change orders, of course, is to hire good designers and to conduct rigorous plan reviews. To improve the latter process in the future, one physical plant member should keep a log of all change orders, noting the timing and type. With this information in hand, planners can then develop a checklist of the most common errors on particular types of buildings to guide future reviews.

The best way to reduce the cost of change orders is to include in the construction contract clauses that restrict the builder's profit margin on extra work. One such clause specifies the percentage of profit markup subcontractors and general contractors will be allowed to add on changes. More often used is a clause detailing in advance the unit prices for all additional work they may have to perform.

The point is simple, but essential: The client must plan on change orders and should never sign a contract that leaves this expensive issue open-ended. Some companies, unfortunately, also plan on change orders. They bid extremely low to win the award, assign experts to pore over contract documents in search of mistakes, and then try to maximize their profits by overcharging for changes. Even though such companies are the exception rather than the rule, the client must be prepared with well-executed drawings, specifications and contract.

THE CONSTRUCTION SCHEDULE

Soon after the award, the contractor should submit to the school a detailed monetary breakdown and a proposed construction schedule. The schedule may take the form of a bar chart or a critical-path-method diagram (CPM), and it should include estimates to the nearest thousand of the contractor's monthly billings. This information allows the college business officer to manage the school's money as effectively as he can, perhaps by investing some of the construction money that will not be needed for several months in short-term certificates.

CONSTRUCTION

THE PRECONSTRUCTION CONFERENCE

In essence, this is an on-the-site coordinating conference. The architect organizes this meeting to iron out last minute details with the contractors, suppliers, subcontractors and plan representative. To prepare for the meeting, the architect sends out an agenda and to follow up he later provides a summary of decisions reached. Relatively minor matters such as timing of the subcontractors, use of power and water, and the parking situation, often stay unsettled until the major contract decisions are made, and this meeting should clear up all such confusions and causes for delay.

LINES OF AUTHORITY

The contracts will spell out the chain of command controlling actual construction. The owner, who provides the site and pays the bills, is the ultimate authority, but the architect usually acts as his agent in all matters related to construction. He can inspect the contractor's work, turn back unacceptable materials and order him to keep to schedule. He can even condemn portions of the job that are poorly executed, and order the contractor to tear them out and rebuild at his expense. He can do this in the owner's name, but he cannot interfere with the way the contractor manages the job or deals directly with the subcontractors and workmen under his control.

Although the college as client is the ultimate authority, it should never try to break the chain of authority or bypass the architect to deal directly with the contractor. Not only is this a violation of the contractual arrangements, but the school that does so may be cheated by an unscrupulous contractor. If the school approves work, equipment or materials the architect disapproves, it may find itself with no legal recourse against architect or builder should problems develop during the guarantee period.

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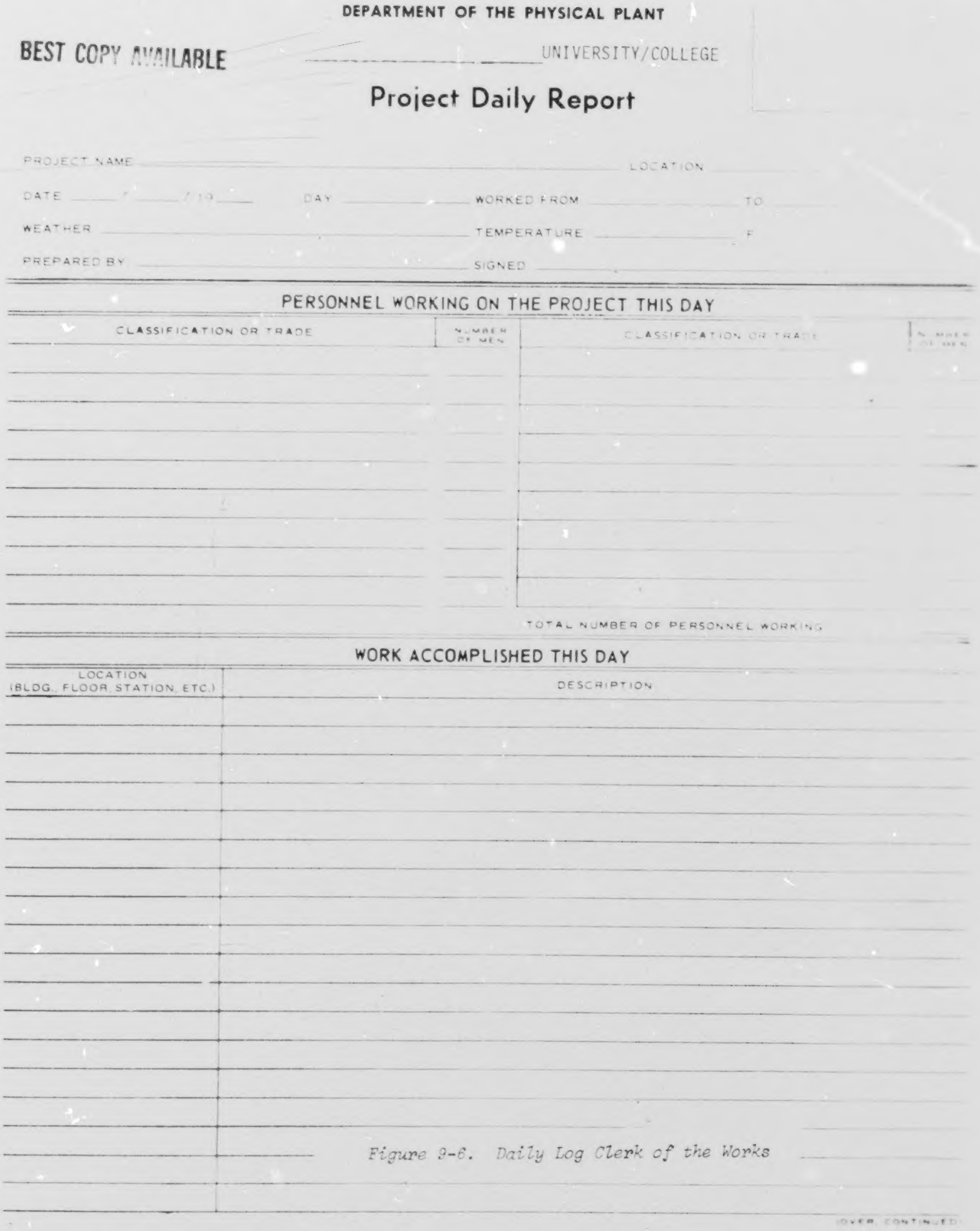

DEPARTMENT OF THE PHYSICAL PLANT

______________ UNIVERSITY/COLLEGE

Project Daily Report

PROJECT NAME ______________ LOCATION ______________

DATE ___/___/19___ DAY ______________ WORKED FROM ______________ TO ______________

WEATHER ______________ TEMPERATURE ______________ F

PREPARED BY ______________ SIGNED ______________

PERSONNEL WORKING ON THE PROJECT THIS DAY

CLASSIFICATION OR TRADE	NUMBER OF MEN	CLASSIFICATION OR TRADE	NUMBER OF MEN

TOTAL NUMBER OF PERSONNEL WORKING ______________

WORK ACCOMPLISHED THIS DAY

LOCATION (BLDG., FLOOR, STATION, ETC.)	DESCRIPTION

(OVER, CONTINUED)

Figure 9-6. Daily Log Clerk of the Works

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SUBCONTRACTOR	WORKING AND WORK ACCOMPLISHED THIS DAY
NAME	DESCRIPTION

EQUIPMENT ON THE PROJECT

TYPE OF EQUIPMENT	NUMBER	TYPE OF EQUIPMENT	NUMBER

SITE VISITS & INSPECTIONS

Reverse side Figure 9-6.

The Owner's Representative

This does not mean that the school should simply ignore its new building during the construction period; on the contrary, it is strongly recommended that the college keep eyes and ears on the job as often and as long as possible. The best way to do this is to appoint an experienced staff member to stay on the job full time as the owner's representative; if this is not possible, the physical plant department should assign someone the task of keeping a daily construction log, as shown in Figure 9-6. The architect may employ his own representative to report to him, and the architect may have a clerk-of-the-works performing a similar job, but the school should also employ an additional person to check the job every day. Duties of a clerk-of-the-works are:

1. Explain contract documents. Assist the contractor via the contractor's superintendent to understand the intent of the contract documents.

2. Observations. Conduct on-site observations and spot checks of the work in progress as a basis for determining conformance of work, material and equipment with the contract documents.

3. Additional information. Obtain from the architect additional details or information if, and when, required at the job site for proper execution of the work.

4. Modifications. Consider and evaluate suggestions or modifications which may be submitted by the contractor to the architect, and report them with recommendations to the architect for final decision.

5. Construction schedule and completion. Be alert to the completion date and to conditions which may cause delay in completion, and report same to the architect. When the construction work has been completed in accordance with the contract documents, advise the architect that the work is ready for general inspection and acceptance.

6. Liaison. Serve as liaison between contractor and the architect and maintain relationship with the contractor and all subcontractors on the job only through the contractor's job superintendent. Protect against the owner issuing instructions to the contractor or his employees.

7. Job conferences. Attend and report to the architect on all required conferences held at the job site.

8. Observe tests. See that tests which are required by the contract documents are actually conducted; observe, record and report to the architect all details relative to the test procedures; and advise the architect's office in advance of the schedules of tests.

9. Inspection by others. If inspectors, representing local, state or federal agencies, having jurisdiction over the project, visit the job site, accompany such inspectors during their trips through the project, record the outcome of these inspections and report same to the architect's office.

10. Samples. Receive samples which are required to be furnished at the job site; record date received and from whom, notify the architect of their readiness for examination; record architect's approval or rejection; and maintain custody of approved samples.

11. Records.

    a. Maintain at the job site orderly files for (1) correspondence, (2) reports of job conferences, (3) shop drawings and (4) reproductions of original contract documents including all addenda, change orders and additional drawings issued subsequent to the award of the contract.

    b. Keep a daily diary on a "Weekly Construction Report" form recording hours by workmen on the job site, weather conditions, temperature range, list of visiting officials and jurisdiction, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures. Included are materials received and work performed.

    c. Record names, addresses and telephone numbers of all contractors and subcontractors, including home telephone numbers.

12. Shop drawings. Do not permit the installation of any materials and equipment for which shop drawings are required unless such drawings have been duly approved and issued by the architect.

13. Contractor's requisitions for payment. Review with all concerned the requisitions for payment as submitted by the contractor and forward them with recommendations to the architect for disposition.

14. List of items for correction. After substantial completion, make a list of items for correction before final inspection, and check each item as it is corrected.

15. College's occupancy of the building. If the college occupies (to any degree) the building prior to actual completion of the work by the contractor, be especially alert to possibilities of claims for damage to completed work prior to the acceptance of the building.

16. College's existing operation. In the case of additions to, or renovations of, an existing facility, which must be maintained as an operational unit, be alert to conditions on the job site which may have an effect on the college's existing operation.

17. Guarantees, certificates, maintenance and operation manuals. During the course of the work, collect guarantees, certificates and maintenance operation manuals and keying schedule, and at the acceptance of the project, assemble this material and deliver it to the architect for forwarding to the college.

18. Limitations of Authority. Do not become involved in any of the following areas of responsibility unless specific exceptions are established by written instructions issued by the architect:

    a. Do not authorize deviations from the contract documents.
    b. Avoid conducting any tests personally.
    c. Do not enter into the area of responsibility of the contractor's field superintendent
    d. Do not expedite job for contractor unless so instructed by architect and the college in writing.
    e. Do not advise on, or issue directions relative to, any aspect of the building technique or sequence, unless a specific technique or sequence is called for in the specifications or by written instructions from the architect.
    f. Do not approve shop drawings or samples.

g. Do not authorize, or advise, the owner to occupy the project, in whole, or in part, prior to the final acceptance of the building.
h. Do not issue a certificate for payment.

NOTE: The instructions to the clerk-of-the-works should be suitable for the project and the capabilities of the individual selected. In some cases, the clerk-of-the-works may be authorized to perform items e. and f. Limitations b. to e. inclusive, apply to the architect as well as to the project representative.

His primary job was already mentioned--to keep a daily log similar to the one kept by the clerk-of-the-works. In it he will note such details as the weather, arrival and work of subcontractors, delivery of materials, and development of problems. It is this last function that may be important enough in itself to justify his salary. By keeping a representative on the job administrators will be able to stay informed about problems and consider possible solutions long before key decisions have to be reached. This employee will also double-check materials and all subcontracted work to make sure they meet quality levels stipulated by the contract. Since he has no authority over workmen, the representatives should first call in experts from the school staff to examine questionable portions of the job before calling it to the attention of the architect. Under no conditions is he supposed to violate the established lines of authority.

PROGRESS REPORTS

One of the architect's jobs is to keep all involved parties informed about the status of the work. He can best do this by issuing bulletins on a regular schedule, perhaps twice a month, but at least once. This document should summarize all decisions, shop drawings, invoices, work completed, financial situation to date, special problems, cost revisions and change orders. On some jobs, photographs and summaries of correspondence are included. Copies should be sent to the institution's representative, chairman of the board of trustees, president, business manager, physical plant director, members of the planning committees, contractor, clerk-of-the-works, subcontractors, and consulting engineers.

INSPECTIONS

On-the-Job Inspections

During construction, staff experts will want to inspect electrical and mechanical systems as soon as they are installed. Even though they do not hold supervisory power, they will want to familiarize themselves with the systems they will have to maintain and operate. If they do think a system was not installed properly, they can inform the architect and ask him to correct the problem. Since these staff personnel will have to live with any built-in mistakes, they should let very few slip by. They may also double-check to see that the installation complies with the contract and all pertinent codes.

The Punch List

Near the end of construction, the architects and engineers will inspect the project for the purpose of drawing up a punch list of uncompleted items. After this tour, the school representatives might also survey the job in order to pick up any problems the professionals overlooked. Since he is the design and construction boss, the architect is not bound to include these suggestions; he is only bound to use his judgment about what constitutes proper fulfillment of the contract. With these reports in hand, the architect draws up the final punch list and sends it to the contractor and the client. By this act he informs all interested parties that he will, as soon as the contractor finishes these items satisfactorily, declare the job complete.

Final Inspections

After the contractor notifies the other parties that the job is ready for final inspection, all principals convene for a tour of the facility. If, as a result of this inspection, the architect and client agree that the contractor has met all the stipulations of the contract, they can then collect any remaining releases of liens and accept the building. When disputes about the work occur between client and contractor, the architect will usually act as mediator and final judge. Most contracts also include an arbitration clause to cover especially complex cases. The traditional arrangement allows both client and contractor to select a representative for arbitration. These two, in turn, choose a third who is acceptable to both, and this triumvirate arrives at final recommendations for settling the controversey.

ACCEPTANCE AND OCCUPANCY

Even in amicable cases, the "final inspection" will often not be final. Strong demands for additional space sometimes force a school to accept a building for "beneficial occupancy" before it is completed. In these cases it is important to clarify exactly when and how the builder will finish his work. It is standard procedure in these situations for the school to retain a portion of the funds as an incentive for the contractor.

Acceptance of a building is official when the architect certifies in writng that the contractor has completed his work and should receive final payment. It means that the school now legally owns and totally controls the building. Because most buildings open with a few incomplete items remaining on a punch list and many pieces of equipment under lengthy guarantees, it would be more accurate to speak of a "schedule of acceptances." For convenience, however, the date on which the school accepts the major portion of the job is designated as the date of acceptance. The important point to note is that this transaction should not be completed before the following administrative details in the original contract have been satisfactorily examined and executed.

CERTIFICATES

Throughout the construction process, experts from various public agencies and professional testing institutes conduct inspections for the purpose of approving such aspects of the job as the concrete (mixture and strengths), structural steel system, the electrical wiring, and fire alarms. The contractor has the responsibility for preparing and collecting all certificates for those inspections and delivering them to the architects for retention in contract files.

GUARANTEES

The contractor should also deliver all guarantees to the client via the architect. It is vital that the client examine each guarantee to ascertain the start of its warranty period. With many similar dates to worry about (date of receipts, date of installation, date of partial acceptance, date of trial, date of final acceptance), it is easy for the client, contractor, supplier, and manufacturer each to have a different date in mind for the start of warranty. Most often the warranty period begins when the equipment is first used by the client normally in satisfactory condition.

OPERATING MANUALS

For efficient continuing use of equipment, it is essential that the contractor compile for the client a complete manual that includes manufacturers' literature, catalog cuts, specifications sheets--in short, all the technical data and instructions necessary for the operation and maintenance of the entire building. The contractor would collect, index and bind all this information in one booklet. After the architect has approved it, the contractor should then provide the physical plant office with three to five copies.

TEST OPERATIONS

After all major construction and inspections have been completed and the client has accepted the building as substantially complete, it is recommended that the architect designate a time for test operations. The contractor should then supply the skilled personnel necessary to operate the structure for a period of five consecutive days of eight hours each. During this period the contractor and his men fully demonstrate all the equipment and instruct the physical plant director and his maintenance personnel in how to operate, adjust and maintain the entire installation.

AS-BUILT DRAWINGS

One of the last and most important contract details is the final set of "as-built" drawings. Because the process of construction inevitably requires changes from the original working prints, it is essential that the school acquire at least one set of revised drawings incorporating these alterations. Such records will prove invaluable when the time comes, for major repairs and remodeling. It is usually the architect's responsibility to provide such drawings, and a stipulation to that effect should be included in his contract.

Such are the tasks and trials of new construction. Planning, design and construction--these are the periods of the game; the academicians and administrators, the architect and his engineers, the contractor and his crews--these are the major players. In a game where it controls none of these phases or groups, the physical plant department must strive constantly to be more than a sideline spectator. At many schools, in fact, this department is the only group that plays in every period and deals directly with every participant. Its important contributions emphasized in the preceding, are technical assistance, liaison, review and inspection. Implied is the advice that this department should also provide whatever general assistance is necessary to help the principal participants move the project forward. A more important recommendation is that the physical plant department try to create that sense of direction so indispensable on a project requiring many different people at each step. In the final analysis, this may be the most important contribution of all.

OUTLINE GUIDE TO PREPARATION

OF A COMPREHENSIVE PLAN OF CAMPUS DEVELOPMENT

The comprehensive campus development plan establishes long-range physical growth goals required to satisfy the institution's plans for academic programs, administrative organization, and enrollments. The major steps are preparation, review and approval, publication, and implementation.

I. PREPARATION

Professional planners and architects should be employed to work closely with a campus long-range planning committee. The major parts of the plan are:

A. A Brief History of the physical growth and development of the campus to provide a context for proposals for future growth.

B. The Academic Plan
   1. Role of the institution in the state system of higher education.
   2. Programs and Policies
      a. The academic disciplines essential to this role.
      b. Disciplines scheduled for growth or upgrading.
      c. Graduate and research programs.
   3. Enrollment projections for each department, college and school.
   4. Faculty and staff projections derived from program and enrollment plans.
   5. Financial projections identifying the amount and sources of funds needed.

C. The Physical Plan
   1. Projections of physical development needs based upon the approved campus Academic Plan and other extra-academic campus programs and activities.
      This section, by its nature, explains the reasons for having a physical plan at all: the dynamic, evolutionary nature of the campus, descriptions of physical facilities needed to carry out academic and research missions, policies on housing, recreation, and parking, etc. A short narrative of recent physical development accomplishments might also be included.
   2. Physical planning objectives and principles.
      Design control guides form the framework of the overall campus form and shape and express the aesthetic spirit of the campus plan.
   3. The physical planning proposals.
      These two sections are the most important parts of the CDP. The Objectives and Principles are the key written postulates of the broad planning goals of the campus; stated in semi-abstract terms, they should endure with few, if any, changes over a long span of time. This section should treat the following topics as they relate to campus development.

a. *Land use and zoning patterns*
Whether a rural or urban site, surrounding land and its use should be assessed for its possible effect on the campus and vice versa. Expected growth patterns adjacent to and involving residential, commercial and industrial facilities need to be anticipated and evaluated concurrently with campus projections.

b. *Community plans and zoning*
Determine immediate and future goals of the community. Such things as park and recreation needs, and cultural-social objectives are a vital part of the planning process.

c. *Traffic and transportation*
In a completely urban situation where mass transit is available, the automobile will continue to be a prime factor in getting students and faculty to and from campus. An analysis of all existing and proposed systems is essential.

d. *Circulation and parking*
New roads, parking areas and major pedestrian ways, need to reflect building and open space requirements and other land uses to insure their proper functioning and to bring a sense of design, order and beauty to the campus. Surface parking, though adequate for interim periods should be studied for ultimate replacement by parking structure.

e. *Utilities and services*
Gas, electricity, fuel, storm drainage, sewage treatment,water, fire and police protection, and waste disposal are all elements affecting campus placement and growth.

Data on their availability, capacities, and future status, and the ability to analyze them are vital to a planning program.

f. *Building sites*
The pleasing functional arrangement of buildings, each with its specific needs of service, approach, grades, mass and form should be accomplished only after the involvement of all of the other considerations listed here.

g. *Housing*
Depending on current and future school policies on housing, the placement of facilities for student (married or single) and faculty-staff should be analyzed for their influence on the campus and community.

h. *Athletics and recreation*
An overall community look must be taken here to guarntee that the placing, size and use of these facilities will be successful.

i: *Open space*

Probably the most abused and least understood are the principles of open space design. Whether large or small, green or paved, enclosed or open; these spaces, if properly disposed can bring excitement, cohesiveness, pleasure and an obvious dignity to the visual campus.

Their coordinated arrangement can reserve land for future uses as well as provide access for service functions and occasional or special needs, but in all cases they must be obviously meaningful.

In order for the planner to evolve a development plan he himself needs a broad thorough knowledge of these nine considerations and should surround himself with additional technical advisors when circumstances demand it.

II. REVIEW AND APPROVAL

Numerous campus groups should review the Academic Plan and Physical Plan during the process of formulation. The long-range campus planning committee will review the Physical Plan with technical review assistance from the physical plant department. Approval comes from the top level administrative officers, the president, and the governing boards. In the case of public institutions, state planning agencies may also have final review and approval prerogatives.

III. PUBLICATION

Once approved, the Campus Comprehensive Development Plan should be published by the institution and made available to campus planning groups, the media, government agencies and the general public. The major parts of the publication would correspond to the sections of the Academic Plan and the Physical Plan. The report should include the following graphic materials:

A. Campus Development Plan drawings that reflect the objectives and principles as stated and illustrate the major physical planning proposals.
B. A map of the existing campus--showing, if possible, relationship of the campus to its immediate surroundings. (It may be advantageious to show such aspects in detail either as to existing or proposed land uses or as to existing or proposed patterns of buildings and development in areas "close in" to the campus.)
C. An oblique aerial photograph of the campus, if available.
D. A map showing the campus in relation to its metropolitan region or subregion (perhaps 10 to 15 mile radius).
E. A drawing illustrating general planning proposals, if any, of the surrounding area--i.e., material from approved General Plans of the adjacent City or County showing land use and circulation proposals that may affect campus development.

IV. IMPLEMENTATION

A schedule of capital construction projects should be approved establishing projected dates for planning, design and construction of facilities specified in the physical planning proposals.

V. CONTINUING REVIEW

Given the rate of change in academic disciplines and proposals, a Comprehensive Campus Development Plan must be a dynamic process rather than a static document. The long-range planning committee, therefore, must hold regularly scheduled reviews for the purpose of revising and updating both the Academic Plan and the Physical Plan. A review every two years would be the ideal.

402

(Page 4 of 4)

APPENDIX 9-B

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OWNERS DESIGN AND CONSTRUCTION CHECKLIST

Date Completed ____________

GENERAL PROJECT DATA

1. Project: ______________________________
2. Owner's Representatives: ______________________ Phone No. ________
3. Date owner desires to occupy building: ______________________
4. Surveyor: ______________________ Phone No. ________
5. Building date: ____________ Size (Sq. Ft.) ____________
6. Special Instructions for handling: Approvals of Material ____________
7. Shop drawings: ______________________________
8. Field reports required: ___ Yes ___ No ___ When ____________
9. Supervision required: ___ Yes ___ No
10. Progress prints required: ___ Monthly ______________________ Other

ARCHITECTURAL

SITE WORK

Demolition, Excavating, Filling, Grading, Planting, Seeding, Paving and Walks

1. _____ DEMOLITION: What ______________________
2. _____ TOPSOIL: ___ Strip & stack ___ Provide: By whom ____________
3. _____ TREES: ___ Remove ___ Protect ___ Provide: By whom ____________
4. _____ FINISH GRADING: By whom ______________________
5. _____ SEEDING: By whom ______________________
6. _____ PLANTING: By whom ______________________
7. _____ WALKS: ___ Concrete ___ Blacktop ___ Scored
8. _____ LAWN SPRINKLER SYSTEM: ___ Athletic fields ___ Other areas
9. _____ TERRACES: ___ Concrete ___ Scored
10. _____ DRIVES: ___ Concrete ___ Blacktop ___ Gravel
11. _____ PARKING AREAS: ___ Concrete ___ Blacktop ___ Gravel ___ Parking Lines
___ Signs ___ Storm Drainage: ___ Run-off ___ Catch basin
12. _____ CURBS: ___ Poured concrete ___ Pre cast ___ Asphalt
13. _____ WIRE FENCING: By whom ______________________
14. _____ FLAGPOLE: ___ Steel ___ Tilt type ___ Halyard boxes ___ Aluminum ___ Height
15. _____ PLAY AREA: ___ Surfaced: ___ Asphalt ___ Grass ___ Synthetic
___ Equipment, swings, etc.
16. _____ ATHLETIC FIELD: ___ Bleachers ___ Bicycle racks
Tracks: ___ Cinder ___ Synthetic
___ Diamonds ___ Benches ___ Backstop ___ Shot Put ___ Pole Vault
___ Long Jump ___ Electrical outlet
17. _____ UTILITIES:

	Existing	New	Utility Company
___ Sanitary Sewer	___	___	____________
___ Septic Tanks	___	___	____________
___ Storm Sewer	___	___	____________
___ Holding Tanks	___	___	____________
___ Water Main	___	___	____________
___ Well	___	___	____________
___ Gas Main	___	___	____________
___ Electricity	___	___	____________
___ Telephone	___	___	____________
___ Future Connections	___	___	____________

18. _____ EXTERIOR LIGHTING:
___ Sidewalks Type: ____________
___ Stairs Type: ____________
___ Drives Type: ____________
___ Parking Lot Type: ____________
___ Building Type: ____________
___ Other Type: ____________

STRUCTURAL SYSTEM (Preference)

1. _____ FRAMING TYPE: ___ Wall bearing ___ Reinforced Concrete ___ Steel ___ Wood
2. _____ ROOF DECK: ___ Poured Gyp. on Gyp. Formboard ___ Reinforced concrete slab
___ Ribbed concrete slab (metal pan) or tile ___ Metal ___ Wood
___ Precast fiber concrete

EXTERIOR WALLS

1. _____ WALL FACING: ___ Face brick ___ Stone ___ Cinder block ___ Curtain wall
___ Pre cast panels ___ Wood ___ Exposed concrete

403

APPENDIX 9-B
(continued)

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Owners Design and Construction Checklist (continued)

Page 2 of 8

INTERIOR WALLS AND PARTITIONS (Preference)

1. ____ BASE: ____ Face brick ____ Glazed brick ____ Ceramic tile cover ____ Other
2. ____ WALLS AND PARTITIONS: ____ CMT ____ Block ____ Demountable ____ Metal (Movable)
____ Metal lath & plaster on metal studs ____ Open planning
3. ____ WAINSCOT: ____ CMT ____ Ceramic tile
4. ____ PAINTED TYPE: ____________ Manufacturer ____________________

WINDOWS

1. ____ MATERIAL: ____ Steel ____ Aluminum ____ Wood ____ Anodized
2. ____ INSULATED PANELS: ____ Porcelain on steel ____ Fiberglass ____ Pre cast
____ Aluminum ____ Other
3. ____ WINDOW SCREENS: Where: ____________________
4. ____ GLAZING: ____ Glare reducing ____ Thermopane ____ Heat Absorbing ____ Plastic ____ Other

FLOORS

1. ____ CONCRETE: ____ Monolithic ____ Separate cement finish
2. ____ RESILIENT: ____ Asphalt tile ____ Rubber tile ____ Vinyl asbestos ____ Vinyl tile ____ Other
3. ____ CERAMIC TILE: Where: ____________________
4. ____ QUARRY TILE: Where: ____________________
5. ____ TERRAZZO: Where: ____________________
6. ____ WOOD: Where: ____________________
____ On wood joists ____ Wood block on mastic
7. ____ STAIR TREADS AND RISERS: ____ Concrete ____ Steel pan & concrete ____ Steel grating or plate
____ Non-slip treads and/or safety nosings ____ Poured terrazzo ____ Pre cast terrazzo
____ Quarry tile ____ Resilient
8. ____ MAT RECESSES: ____ Mats By whom: ____________________
9. ____ GYM FLOORS: What material: ____________________
10. ____ TARTAN FLOORS:
11. ____ FLOOR INSERTS: Where: ____________________
Type: ____________________

CEILINGS (Preference)

1. ____ ACOUSTIC TILE: Where: ____________________
____ Lay in ____ Z bar ____ On sheeting ____ Fire rated
2. ____ PLASTER: Where: ____________________
____ Gypsum ____ Acoustic ____ Cement
3. ____ METAL: ____ Aluminum ____ Steel ____ Painted
4. ____ EXPOSED CONSTRUCTION: Where: ____________________
5. ____ OTHER: ____________________

ROOFING, SHEET METAL AND INSULATION (Preference)

1. ____ ROOF: ____ Flat ____ Pitched ____ Saddles
2. ____ COMPOSITION ROOFING: ____ Smooth ____ Gravel
3. ____ BONDED ROOFING: ____ 10-year ____ 15-year ____ 20-year
4. ____ FLASHING: ____ Stainless ____ Aluminum ____ Copper ____ Zinc
5. ____ GRAVEL STOPS AND FACIAS: ____ Extruded aluminum ____ Copper ____ Other
6. ____ SKYLIGHTS: Where: ____________________

DOORS AND FRAMES

1. ____ EXTERIOR DOORS: ____ Wood ____ Hollow metal ____ Aluminum ____ Steel
2. ____ INTERIOR DOORS: ____ 1 2/4" Wood ____ Hollow metal ____ Aluminum ____ Steel
____ Anodized ____ Wire mesh
3. ____ EXTERIOR FRAMES: ____ Wood ____ Hollow metal ____ Steel channel ____ Aluminum
____ Steel ____ Removable mullions
4. ____ INTERIOR FRAMES: ____ Wood ____ Steel channel ____ Removable mullions
____ Hollow metal ____ Aluminum
5. ____ THRESHOLDS: Type preferred: ____________________
6. ____ OVERHEAD DOORS: ____ Wood ____ Steel panel ____ Aluminum panel ____ Fiberglass
____ Electrically operated ____ Manually operated
7. ____ OVERHEAD ROLLING CLOSURES: ____ Steel ____ Wood ____ Grille ____ Aluminum
____ Electrically operated ____ Manually operated
8. ____ FOLDING GATES: ____ Deep cabinet ____ Shallow cabinet
9. ____ VAULT DOOR:
10. ____ WALL SYSTEM DOORS AND FRAMES: ____ Yes ____ No
11. ____ SPECIAL OPENINGS: Where: ____________________
Size ____________________

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Owners Design and Construction Checklist (continued)   Page 3 of 8

MISCELLANEOUS AND ORNAMENTAL METAL
1. _____ STEEL LADDERS:
2. _____ HATCHES: ____ Roof ____ Floor ____ Ceiling
3. _____ PIPE BUMPERS:
4. _____ GUARD RAILS:

GYMNASIUM AND/OR MULTIPURPOSE ROOM
1. _____ BASKETBALL BACKSTOPS: Types ______________________________
____ Fan Shape Rectangular ____ Manually operated ____ Motor operated ____ NIC
2. _____ VOLLEY BALL AND BADMINTON: ____ Floor plates
3. _____ FOLDING STAGE: ____ NIC
4. _____ FOLDING TABLES: ____ Recessed in wall
5. _____ FOLDING GYM PARTITIONS: ____ Recessed ____ Covered ____ Aluminum ____ Wood
____ Manual ____ Motor operated
6. _____ BLEACHERS: ____ Fixed ____ NIC ____ Movable ____ Motor operated

TOILET PARTITIONS AND DOORS - SHOWER PARTITIONS
1. _____ TOILET PARTITIONS: ____ Metal ____ Marble ____ Floor supported ____ Suspended
2. _____ TOILET PARTITION DOORS: ____ Metal ____ Wood
3. _____ SHOWER PARTITIONS: ____ Metal ____ Masonry ____ Prefab ____ Marble

CHALKBOARD AND TACKBOARD
1. _____ CHALKBOARD: ____ Glass ____ Slate ____ Steel ____ Composition ____ Plastic ____ Color
2. _____ TACKBOARD: ____ Cork ____ Vinyl covered ____ Color ____ Other

STAGE CURTAIN AND DRAPERY TRACKS
1. _____ STAGE CURTAIN TRACK: Type ______________________________
____ Electrically operated ____ Manually operated
2. _____ DRAPERY TRACKS: Type ______________________________
____ Draw cords ____ Exposed track ____ Recessed track
____ Drapes By whom: ______________________________
3. _____ VENETIAN BLINDS:
4. _____ ROLL-UP SHADES:
5. _____ LIGHT PROOF SHADES:
6. _____ PROJECTION SCREENS: ____ Electric ____ Manual

HARDWARE
1. _____ FINISH: ____ Dull chrome ____ Polished chrome ____ Black
____ Match existing ____ Stainless steel ____ Other: ____________________
2. _____ KEYING: ____ Interchangeable core system
____ Master-keyed to Building system Manufacturer: ____________________
____ Pin tumbler
____ Construction cores
3. _____ MANUFACTURER: ____ Russwin, Glynn Johnson, Von Duprin or Equal Standard Brands
4. _____ KEY CABINET:

LOCKERS AND METAL SHELVING
1. _____ SIZES: ______________________________
2. _____ TYPE: ____ Recessed ____ Free standing ____ One person ____ Two person ____ Suspended
3. _____ TOP: ____ Sloped ____ Flat ____ Multiplier: No. ____________
4. _____ BASKETS: Size ____________
5. _____ METAL SHELVING: Sizes ____________________
6. _____ BASE: ____ Metal ____ Masonry

LIGHTING PROTECTION
1. _____ REQUIRED: ____ Yes ____ No
2. _____ LOCATION: ____ Chimney ____ Elsewhere

ELEVATOR
1. _____ TYPE: ____ Passenger ____ Freight ____ Gear drive ____ Hydraulic
2. _____ CAPACITY: __________ lbs.
3. _____ NUMBER OF STOPS: ____________
4. _____ PLATFORM SIZE: ____________
5. _____ CARD DOOR TYPE: ____ Single slide ____ Bi-parting
6. _____ HOISTWAY DOOR TYPE: ____ Bi-parting ____ Regular pass ____ Emergency lighting

AUTOMOBILE HOIST
1. _____ TYPE: ____ Passenger car ____ Single post ____ Oildraulic
____ Bus and Truck ____ Twin post ____ Other

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Owners Design and Construction Checklist (continued)

SPECIAL EQUIPMENT	N/C	In Building Contract	Separate Contract
1. ______ KITCHEN:	___	______________	______________
2. ______ HOMEMAKING:	___	______________	______________
3. ______ CLOTHING:	___	______________	______________
4. ______ SCIENCE:	___	______________	______________
5. ______ DARK ROOM:	___	______________	______________
6. ______ ________	___	______________	______________
7. ______ TRASH DISPOSAL SYS:	___	______________	______________
___ Incinerator	___ Dumpster	___ Compactor	___ Vacuum system
8 ______ LDRY EQPT:	___	______________	______________

MECHANICAL

HEATING AND VENTILATING SYSTEM (Preference)

1. ______ TYPE: ____ Hot water ____ Steam hot water ____ Steam
2. ______ RADIATION: ____ Perimeter wall fin ____ Convectors ____ Ceiling radiant ____ Wall radiant in pool
3. ______ STACK: ____ Masonry ____ Steel
4. ______ UNIT VENTILATORS: ____ Utility cabinets
5. ______ CENTRAL SYSTEM VENTILATING UNIT: ____ Face & by-pass dampers ____ Motorized valves ____ Variable speed motors
6 ______ PIPE COVERING: ____ Boiler room ____ Above ceilings: ___Yes ___No
7. ______ DUCT INSULATION: ____ Thermal ____ Acoustical
8. ______ BOILER WATER TEMPERATURE: ____ Constant ____ Three-way valve
9. ______ BOILER WATER TEMPERATURE VARIABLE WITH OUTSIDE TEMPERATURE: ________
10. ______ CHEMICAL FEEDER ON BOILER ____: ____ Present Chemical ____ Treatment system
11. ______ DESCALERS: ________
12. ______ EXPANSION JOINTS: ________
13. ______ EXPANSION TANK: ________
14. ______ CIRCULATING PUMPS: ____ Motor mount ____ Concrete bases ____ Other
15. ______ AIR FILTERS: ____ Throw-away type ____ Other
16. ______ AIR DIFFUSORS: ________
17. ______ GRILLES: ________

AIR CONDITIONING SYSTEM

1. ______ SPACES TO BE AIR CONDITIONED:
   - ____ Entire building
   - ____ Entire building less (public toilets) (custodial closets) (equipment rooms) (receiving rooms) (storage rooms)
   - ____ Other ________
   - ____ None ________
2. ______ TYPES OF INTERNAL LOADS:
   - ____ Occupancy ________ ____ Lighting ________
   - ____ Other heat exchanges (i.e. special equipment) ______________
3. ______ AIR CONDITIONING SYSTEM WILL:
   - ____ Connect to existing system
   - ____ Space to accommodate new equipment has been provided
   - ____ Existing system has been sized for expansion
   - ____ Be entirely new
4. ______ USE: ____ Year-around ____ Partial
5. ______ TYPE OF SYSTEM:
   - ____ Direct expansion ____ Zone self-contained ____ Room self-contained
   - ______ ALL WATER: ____ Fan-coil unit re-circulating ____ Fan-coil unit with outdoor air
   - ______ ALL AIR (CENTRAL STATION SYSTEM):
     - ____ Volume air control ____ By-pass (constant volume)
     - ____ Re-heat ____ Multi-zone ____ Dual duct
   - ______ AIR-WATER: ____ Induction ____ Panel-air ____ Heat Pump
6. ______ REFRIGERATION EQUIPMENT: ____ Reciprocating ____ Centrifugal ____ Absorption
7. ______ HEAT REJECTION APPARATUS:
   - ____ Evaporative condenser ____ Air cooled condenser ____ Cooling tower

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Owners Design and Construction Checklist (continued) Page 5 of 8

DOMESTIC WATER HEATING SYSTEM
WATER HEATER:
1. ____ Gas fired storage type heater ____
2. ____ Oil fired storage type heater ____
3. ____ Gas fired instantaneous heater with separate storage tank ____
4. ____ Storage tank with boiler water through coil in tank ____
5. ____ Storage tank with intermediate instantaneous heater ____
6. ____ Instantaneous heater in boiler water ____
7. ____ Pool heater ____
8. ____ Cathodic protection ____
9. ____ Makes acceptable to owner: ____ ____

BOILER-BURNER SYSTEM
1. ____ HOT WATER ____ Steam ____
____ Package unit ____ High firebox ____
A. ____ Fuel: ____ Oil ____ No. ____ Gas
B. ____ Ignition:
____ Gas ____ Electric ____ Electric gas ____ Electric bottle gas
C. ____ Makes acceptable to owner: ____ ____
____ OIL STORAGE: Gallons ____

TOILET AND SHOWER ROOM ACCESSORIES
1. ____ SOAP DISPENSERS: ____ Lather ____ Solid ____ Tank
A. ____ Furnished by owner ____ Contractor ____
B. ____ Installed by owner ____ Contractor ____
C. ____ Makes acceptable to owner: ____
2. ____ PAPER TOWEL CABINETS: ____ Single fold ____ Double fold
A. ____ Stainless steel ____ Enamel ____
B. ____ Furnished by owner ____ Contractor ____
C. ____ Installed by owner ____ Contractor ____
D. ____ Makes acceptable to owner: ____
3. ____ TOWEL BARS: ____
4. ____ GRAB BARS: ____

FIRE PROTECTION
1. ____ HOSE CABINETS:
A. ____ With extinguisher B. ____ Less extinguisher
C. ____ Hose for house use only D. ____ Hose for house and fire department use
2. ____ SPRINKLER SYSTEM: ____
3. ____ FIRE HYDRANTS: ____
4. ____ CO-2 SYSTEM: ____
5. ____ FIRE SIGNAL SYSTEM: ____ Internal only ____ Horn ____ Bell ____ Siren
____ External to other location
6. ____ LOCAL FIRE MARSHAL

ELECTRICAL

ELECTRICAL SERVICE
1. ____ POWER COMPANY ____ Contact: ____ Phone: ____
2. ____ SERVICE
A. ____ Type: Existing ____ Secondary ____ Overhead ____ New ____
Primary ____ Underground ____
B. ____ Voltage ____ 115-208v., 3w., single phase light and power
____ 115-208v., 4w., single phase light & 3-phase power
____ 208-440-277v., 4w., 3-phase light and power
____ Primary ____ Volts ____
____ Other ____
C. ____ Transformers: ____ On pole by power company
____ Transformer room in building by contractor
____ Transformers by power company
____ Transformers by owner
____ Stand by provisions
D. ____ Remarks: ____ ____

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Owners Design and Construction Checklist (continued) Page 4 of 8

ELECTRICAL DISTRIBUTION

1. ______ PANELS: Distribution, fusible ____________ Breaker ____________
Lighting, fusible ____________ Breaker ____________
Power, fusible ____________ Breaker ____________

LIGHTING

1. ______ Major General Lighting: ____________________ Incandescent
____________________ Rapid start fluorescent
____________________ Slimline
____ (a) Makes acceptable to owner: ____________________

2. ______ CORRIDOR: Incandescent ____________ Slimline ____________
Rapid start ____________ Circline ____________
Type ____________________
3. ______ GYMNASIUM: Incandescent ____________ Rapid start ____________ Slimline ______
4. ______ Type ____________________
4. ______ AUDITORIUM: Rapid Start ________ Troffers ________ Slimline ________
Coves ________ Incandescent ________ Downlites ________ Dimming ______
5. ______ ATHLETIC FIELD LIGHTING: ________ Type ____________________
6. ______ OTHER: ____________________
7. ______ EMERGENCY LIGHTING: ________ By whom ____________ Make ____________

CLOCKS

1. ______ TYPE: Synchronous Electric: ________ Hourly corrective (automatic correction)
________ Dual motor (manual corrective)
________ Individual (dual - single motor)
________ Electronic
____ Minute Impulse Electric ____________________
Pneumatic ____________________
2. ______ MOUNTING: Surface ____________ Semi-Flush ____________
3. ______ MATCH EXISTING SYSTEM: ____________ New System ____________
4. ______ SWEEP SECOND HANDS: ____________
5. ______ Makes Acceptable to Owner: ____________________
6. ______ REMARKS ____________________

SIGNAL SYSTEM

1. ______ NEW SYSTEM ____________ Connect to existing system ____________
2. ______ TYPE SIGNALS: Bells ____ Horns ____ Chimes ____ Surface Mtd. ____ Flush ____
3. ______ MAKES: ____________________
4. ______ REMARKS: ____________________

FIRE ALARM SYSTEM (Closed supervised type):

1. ______ NEW SYSTEM ____________ Connect to existing system ____________
2. ______ TYPE: ____________ Common code, continuous operation
____________ Common code, automatic 4-minute shut off
____________ Coded, continuous operation
____________ Coded, per signal, continuous operation
3. ______ MAKES: ____________________
4. ______ REMARKS: ____________________

INTER-COMMUNICATION TELEPHONE SYSTEM

1. ______ CONDUIT ONLY ____________ Equipment in contract ____________
wiring only in contract ____________
2. ______ NEW SYSTEM ____________ Connect to existing system ____________
3. ______ TYPE: ____________ Individual line
____________ Party line, common ring
____________ Party line, selective ring
4. ______ SPECIAL FEATURES: Code call ____ Conference service ____ Executive priority ____
____
5. ______ MAKE: ____________________
6. ______ REMARKS: ____________________
7. ______ LOCATION ____________ Fields ____________ Other ____________

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SOUND SYSTEM
1. _____ NEW SYSTEM ____________________ Connect to existing system ____________________
2. _____ CONDUIT ONLY ____________________ Equipment in contract ____________________
wiring only in contract ____________________
3. _____ TYPE: ____________________ Single channel, paging only
____________________ Single channel, individual room contact
____________________ Dual channel, paging only with following feature
____________________ Sound pick-up & distribution from external area:
Gym ____ Aud. ____ Band & Chorus ____ Pool ____ Field ____
4. _____ SUPPLEMENTARY EQUIPMENT:
____ Auditorium sound system
____ Gymnasium sound system
____ Band-chorus sound system
____ Broadcast station (individual)
____ Athletic PA system
5. _____ MAKE: ____________________
6. _____ REMARKS: ____________________
____
____

TELEVISION SYSTEM
Conduit only _____ Equipment in contract _____
Make: ____________________
Remarks: ____________________

OUTSIDE TELEPHONE SYSTEM
1. _____ NEW CONDUIT LAY OUT __________ Extend existing system ____________________
2. _____ TELEPHONE COMPANY ____________________
Contact ____________________ Telephone ____________________
3. _____ SERVICE: Overhead __________ Underground __________
4. _____ REMARKS: ____________________

STAND BY ELECTRIC PROVISIONS
1. _____ BATTERY ____________________ Other ____________________

SECURITY SYSTEM
1. _____ CONDUIT ONLY ____________________ Door security ____________________
2. _____ SOUND DETECTION ____________________ Internal system ____________________
3. _____ SMOKE DETECTION ____________________ Service contractor ____________________

DIAL RETRIEVAL SYSTEM
____

COMPUTER TERMINAL LOCATIONS
____

SCORE BOARDS
1. _____ GYM ____________________ FIELD ____________________

ALTERNATES

Alternates will be acceptable to the owner on a:

____________________ Deductive basis

____________________ Additive basis for the following items of the work to be performed by the contractor:

____

____

____

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SPECIAL CONDITIONS FOR CONSTRUCTION

A. _____ The architect shall adhere to such special conditions with respect to bidding procedures, insurance, bonding, etc., as the owner has attached to this outline.
_________ Enclosed _________ Separate cover

B. _____ The following agencies or persons may be of assistance to the architect in his planning:
State ______________________________
County ______________________________
City ______________________________
Township ______________________________

C. _____ Special consideration should be given but not limited to the following conditions during construction:
1. _____ Storage of materials
_________ On site _________ In the building
2. _____ Construction offices
3. _____ Traffic controls
_____ On site
_____ Off site
_____ Deliveries
_____ Load limits
4. _____ Parking
_____ Contractors employees
_____ School personnel
5. _____ Noise abatement
6. _____ Fire control
7. _____ On site signs
8. _____ Surface drainage during construction
9. _____ Site security
_____ Fencing
_____ Guards
_____ Lighting
10. _____ Site clean up
_____ Building
_____ Grounds
11. _____ Use of existing buildings and utilities conditions ____________________
____
____
12. _____ Accident prevention and safety
13. _____ Adherence to OSHA standards ____________________
____
____
14. _____ Environmental protection measures ____________________
____
____

D. _____ Other items to be considered:

_____ School semester schedule

_____ Owners overtime expense when contractor works outside of normal work week

_____ Pre-construction conference with owner and other agencies

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GUIDELINES FOR A PROGRAM OF ARCHITECTURAL REQUIREMENTS

a) A statement of educational philosophy with objectives for the program. Immediate and long-range.
b) Enrollment -- now and projected with ratio of men to women.
c) Breakdown of campus population by groups and sex.
d) Description of educational program for the present and future.
e) A complete and accurate listing of the physical requirements for the educational program and those that are to be used by non-academic employees.
f) Detailed description of the amount and kind of equipment to be used -- both fixed and movable, (audiovisual, etc.).
g) Detailed description and location of utilities available and required -- present and future.
h) A time-table for completion.
i) Budget limitations.
j) Site date for the building and surrounding area including recent survey with indication of all utilities, elevations, contours, inverts. Present and long-range development of site. Relationship to academic, housing and recreational areas. Roads, walks, traffic patterns, parking
k) Number, size and function of rooms and spaces.
l) Location and inter-relation of rooms and spaces.
m) Statement as to who will use the facility besides the students. Relationship to the community. Approximate total number of people at one time (men and women).
n) Description of activities to take place in each area -- indoor and outdoor.
o) Environmental atmosphere requirements in spaces: acoustical, visual, thermal.
p) Recommendations for aesthetics and character desired.
q) Provision for handicapped (ramps, railings, etc.).
r) Miscellaneous information: Amount and type of storage, security, chalkboards, projection screens, bulletin boards, etc.
s) Related information for future projects.

NOTE: To supplement these, the pertinent items that specifically apply to the particular new building should be added.

GUIDELINES FOR SPECIFIC TYPES OF BUILDINGS

CLASSROOM BUILDING:

(a) Number and sizes of classrooms stating maximum seating in each and function.
(b) Amphitheater type lecture hall: Number of seats, stage or platform, projection booth, demonstration table, lectern, audiovisual aids, number of screens to be used at one time, TV systems.
(c) Offices for faculty and staff.
(d) Conference Room: Size and location.
(e) Seminar rooms: Number, maximum seating in each and location.
(f) Bulletin and display boards: directory of rooms.
(g) Provisions for hanging coats and temporary "checking" of books -- in classrooms or corridors?
(h) Audiovisual systems and tie-in with other campus facilities.
(i) Furniture and Equipment: Fixed and movable.
(j) Vending machines.

LIBRARY:

(a) Description of the general intent of the library, whom it is intended to serve, how it wishes to do so, relation to the community.
(b) Total number of books and number of periodicals to be contained, with breakdown of total by general categories.
(c) Special areas: Rare book room, displays, exhibits.
(d) Reserved books, reference area.
(e) Reading areas: Functions, sizes and locations.
(f) Stack areas.
(g) Librarian's office: Relation to other areas.
(h) Work room: Number of people working and their functions. Relation to librarian and other areas.
(i) Lighting as related to general areas, stack areas.
(j) Areas for listening to recorded music, lectures, languages, etc.
(k) Directory, bulletin board.
(l) Book lift.
(m) Receiving area and storage.
(n) Sound control throughout.
(o) Fixed and movable furniture: Type and sizes of stacks, card catalog, charging desk, etc.
(p) Control at charging desk area and security system for entire building.

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GUIDELINES FOR PROGRAM OF ARCHITECTURAL REQUIREMENTS (Page 2 of 3)

PHYSICAL EDUCATION BUILDING:

1. OBJECTIVES of the Physical Education program. Short and long-range.
2. LOCATION -- site evaluation Related to teaching and living centers on campus.
3. DATA FOR PROGRAMMING
   - (a) Enrollment now and projected. Ratio of men and women.
   - (b) Breakdown of population by groups.
   - (c) Programs now and future. Date limitations of various sports and classes.
   - (d) Inter-collegiate sports. Intra-mural sports.
   - (e) Faculty use. Population: used by family.
   - (f) Community use. Source of revenue and public relations.
   - (g) Present and future policy of relationship with community.
   - (h) Programs for the handicapped.
   - (i) Time-table for construction.
   - (j) Budget limitations.
4. PRESENT OPERATION and existing facilities and future requirements.
5. ELEMENTS FOR INTERIOR SPACE
   Core, gymnasium, natatorium, basketball arena, and number of spectators in each area, fixed or folding bleachers, field house area, handball court, lockers, fencing, dance instructions, weight lifting, classrooms, conference rooms, library, trainers room, infirmary, first-aid room, snack bar, concessions, vending area, band storage, pool and ping pong, TV, corrective gym, projection booth, stage and related services, club rooms, towel issue, administration offices, general offices, alumni offices (common use for printing), public relations office, coat room, public rest rooms, laundry (self-service or maintained), entrance lobby (in proportion to population), vertical circulation, corridors, mechanical and electrical equipment rooms, general and specific storage, janitorial rooms.
   Field house should be large enough to include football, soccer, basketball practice, tennis, track events, with adequate space for some spectators.
6. ELEMENTS FOR EXTERIOR SPACE
   Playing and practice fields for inter-collegiate and intra-mural sports. Parking for instructors, visitors and spectators.
7. PHASING THE PROJECT
   With budget limitations, the project should be subdivided into phases for immediate and long-range construction.
8. If a student union building is planned for the future, the physical education building might be used in this capacity until it is constructed. The physical education facilities are often used in collaboration with a student union.

SCIENCE BUILDING:

- (a) Laboratories: Function, size, number, occupancy, service requirements, storage, table top material.
- (b) Classrooms and lecture hall: Size, relationship to laboratories, maximum number of students, demonstration table, audio-visual aids, preparation rooms, storage.
- (c) Instrument center.
- (d) Balance room: Number of balances, humidity and temperature range, location.
- (e) Offices and conference room: Relation to secretarial space: visual aids.
- (f) Computer room: Specific equipment, raised floor, temperature and humidity limits.
- (g) Greenhouse: Size, location and special considerations.
- (h) Faculty lounge: Double as conference room, kitchenette.
- (i) Display area: Exhibits.
- (j) Animal room: Food storage, special climate control.
- (k) Research stations and private laboratories: Size, function, special equipment, who and how many will use research facilities.
- (l) Special areas: Nuclear research, equipment, furnishings, headroom.
- (m) Stock room: What is stored, types of containers, location.
- (n) Dark room.
- (o) General storage, receiving: Function, loading platform, service elevator.

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CHAPEL:

(a) General statement of functions, what denominations to be accommodated: One or more auditoria? Who will use and what is maximum seating at one time?
(b) Specific data from college chaplains to accommodate (rituals of different faiths).
(c) Special orientation?
(d) Choir location and size.
(e) Organ: Type, size and location.
(f) Audiovisual aids provision.
(g) Coat rooms and rest rooms.
(h) Rooms for chaplain(s).
(i) Sacristy vestment storage.
(j) Pulpit, lectern.
(k) Altar or table.
(l) Character of interior and exterior including type of windows.
(m) Pews, chairs, special equipment.

DORMITORY:

(a) Number of beds and division by sex, if coed dormitory.
(b) How many single rooms to provide.
(c) Suites with kitchenettes? How many in each suite?
(d) High rise -- or low structure.
(e) "Bowling alley" corridors or minimal size halls?
(f) Dining facility details, if included; snack area; vending.
(g) Furnishings: Built-in and movable.
(h) Apartment including office for housekeeper or manager.
(i) Space for proctors.
(j) Storage area for trunks and suitcases.
(k) Quiet (study) lounges; other lounges (visitors - recreation).
(l) Provision for mail.
(m) Public rest rooms (1st floor).
(n) Gang toilets and showers, or other arrangement.
(o) Service entrance with area for miscellaneous storage.

413

10

OTHER FUNCTIONS

INTRODUCTION.. 433-435

COMMUNICATIONS...................................... 436-441
Figure 10-1: Centrex Console Compared with PBX Switchboard and a Student ID Card Sample

MAIL AND MESSAGES................................... 441-443

TRANSPORTATION AND MOVING........................... 443-451
Figure 10-2: Sample Room Reservation Form
Figure 10-3: Sample Reservation Form for Space and Special Set-ups.

SOLID WASTE DISPOSAL................................ 452-454

10

OTHER FUNCTIONS

THE EXPANSION AT ANY SCHOOL produces growing pains for the whole institution and especially sharp ones for its physical plant department. Often this agony originates when the department tries or is asked to assume functions that do not clearly relate to its mission as originally defined, or that do not fit neatly into its administrative structure as currently organized. The question of definition--should the physical plant department handle communications, mail, transportation, trash, etc.--is less important than the question of administration--could the department manage these duties more efficiently than a private firm or separate department. Answering the second question will usually answer the first. If the physical plant department can furnish a service more efficiently than anyone else, then it probably should, at least when providing low-cost quality education is more important than stimulating the local economy or expanding the institution's bureaucracy.

Administrators at each school must devise the organization most appropriate to its locale, size and needs. In their effort to do so, they must consider the guidelines in this chapter. These suggestions constitute the conventional wisdom about how physical plant departments at small schools might approach certain "extra" functions.

Chapter 10
OTHER FUNCTIONS

COMMUNICATIONS

THE TELEPHONE SYSTEM

The most complicated kind of extra service is electronic communications, and the most complicated of these is the telephone system. Because of the increasing complexity of electronic technology, several important qualifications should be noted at the start. The first is that new services and new options may be available by the time this manual leaves the presses. The second point is that some of the services discussed in this chapter may not be available in all parts of the country. Although the Bell System--the source of much of the information in this section--does include a majority of the telephone companies, numerous independent other companies also operate around the country, and they may offer different services. Not all Bell subsidiaries, moreover, offer all these services and options.

Planning

Given the state of the market, the physical plant director should assign at least one person to keep abreast of developments in the communications industry and to negotiate with the local company. His most important task is to periodically review the current system to see whether improvements or the installation of a new system are justified. To explore the communications needs of the institution, he can at any time ask the telephone company to perform an in-depth study; he can hire a consultant to do the same; or he can take on the job himself.

Although most telephone company representatives do such studies for no charge and no commission, many administrators worry about contracting for more services than the school needs, and hire private consultants to double-check the system. Such a move may be sound, but can never be fail-safe. Though private consultants of ability and integrity are available, it may be difficult in the absence of national examining and licensing organizations to ascertain the expertise of a consultant before employment. An additional problem can develop if a zealous expert recommends overly drastic reductions that appear to create savings, thereby justifying his fee. If the department's telephone supervisor has the expertise, he can organize such a study himself.

Before choosing a system, administrators must make a basic policy decision whether the school will provide telephones only for the administrative, instructional and staff, or whether it will also extend service to resident students. In the past many schools, small and large, have simply installed pay units in student unions and dormitories, but company officials claim that the trend is to provide more personal services through a unified system for staff and students. An in-depth study of the kind mentioned on the preceding page could help administrators reach or reevaluate such a decision by investigating how and at what cost the following systems would satisfy the school's communications needs.

The Key System. The key system is the simple, multiphone hookup found in most small private offices. It consists of one answering station and one operator who takes incoming calls and switches them to the proper person by means of buttons on the unit. There is no technical limit to the number of lines that can run off each answering station, but there are administrative limits. An operator in this kind of office usually handles other duties also, and can seldom manage more than 20 lines efficiently.

The Manual Multiple Switchboard. Widely used in large offices, this switchboard is appropriate when more than 20 lines are needed. According to the telephone company, however, the effective range seldom goes above 2 operators handling 12 lines each. This estimate is quite rough because the system may also serve purposes other than the simple routing of calls; for example, the operators might be expected to provide basic information and act as an answering or message service.

A switchboard that is totally manual has certain inherent limitations. All calls, including internal ones, have to go through the central operators. On a campus with combined staff and student service, this arrangement may work most of the time with heavy staff use during the day balanced by heavy student use during the afternoon and evening. Occasions will arise, however, when half the students on campus and some of the staff want to place calls at the same time, and the switchboard will have trouble handling such heavy traffic. Operators' salaries can pose another problem, although schools isolated in job-poor areas may be able to employ students at a low rate on a part-time basis.

The PBX Dial System. As with the manual switchboard, the operator in a PBX system must take and reroute all incoming calls. Internal and outgoing calls, however, can bypass the operator automatically, thus saving money for the school and time for the users. In addition, various options can be wired-in to protect against uncontrolled long-distance dialing. By the restricted station method internal units could be limited to incoming and local calls. Another and more efficient alternative possible under this system is the rerouting of long-distance calls to a recording or an operator who would ascertain who pays before placing the call. These, however, are the kinds of options that may not be available on every switchboard model or in all areas of the country.

Centrex. Centrex costs the most money and features the most advantages and widest range of optional features. Direct in-dialing, for instance, reduces the operator's job to simply providing information such as new or unlisted numbers. All out-dialed calls are automatically identified to simplify long-distance service and billing. The options can include restricted stations for dialing only within the system, and various hookups for transfer, add-on and conference calls. An additional benefit to the Centrex system is smaller size. As shown in Figure 10-1, the Centrex console is considerably smaller than the PBX switchboard. Also shown are both sides of a student long-distance identification card used at West Liberty College with Centrex. The danger of this system lies in its advantages; administrators may be tempted to contract for more service than the school actually needs or can realistically afford.

Information Retrieval Systems. Use of the telephone to withdraw information from tape libraries and computer banks involves state-of-the-art technology that few small schools can afford. A common procedure is for several small schools located in the same area to combine to share such a service at more reasonable rates.

RADIOS

The 1960's brought the major radio systems to wide use on campuses around the country. The simpler paging units provided grounds and buildings supervisors with a cheap, easy way to establish contact with their work crews, and the more sophisticated two-way transmitting and receiving units proved invaluable in campus security work. Major types are:

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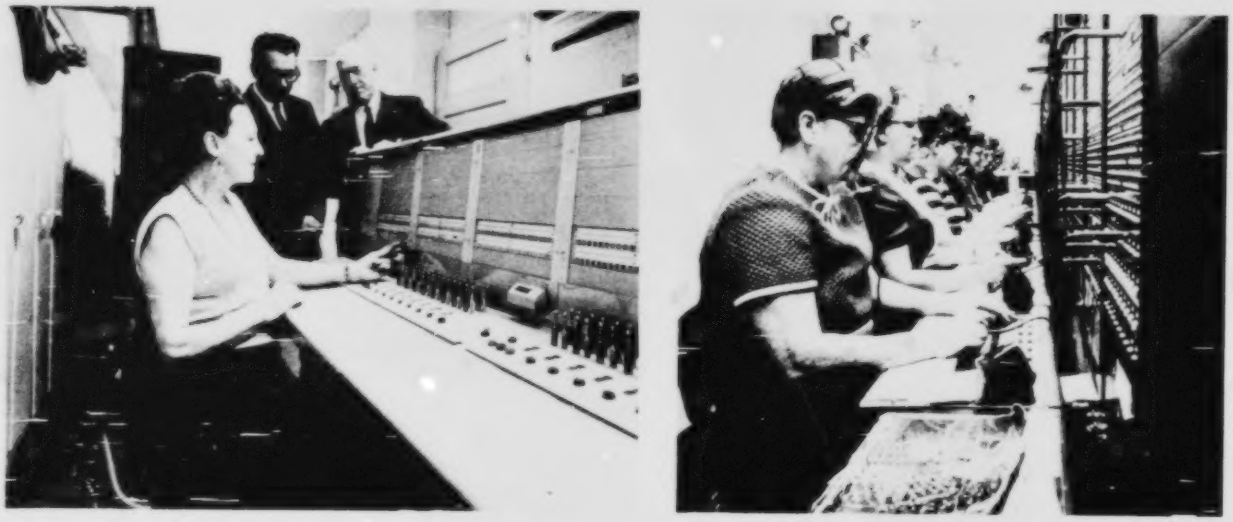
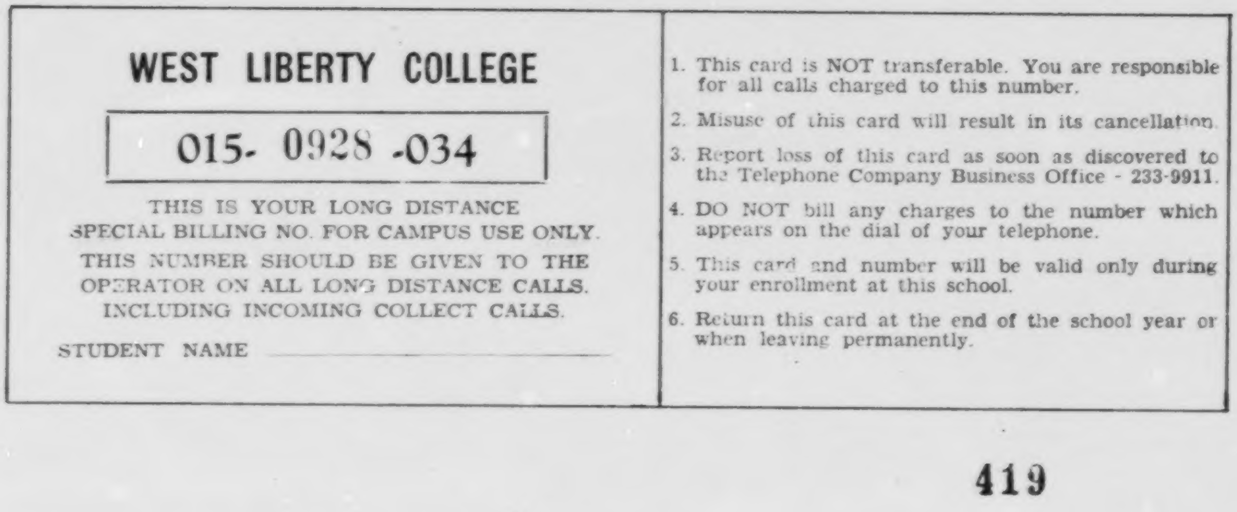


Figure 10-1. Centrex Console Compared with PBX Switchboard



WEST LIBERTY COLLEGE

015- 0928 -034

THIS IS YOUR LONG DISTANCE
SPECIAL BILLING NO. FOR CAMPUS USE ONLY.
THIS NUMBER SHOULD BE GIVEN TO THE
OPERATOR ON ALL LONG DISTANCE CALLS.
INCLUDING INCOMING COLLECT CALLS.

STUDENT NAME ______________________

1. This card is NOT transferable. You are responsible for all calls charged to this number.
2. Misuse of this card will result in its cancellation.
3. Report loss of this card as soon as discovered to the Telephone Company Business Office - 233-9911.
4. DO NOT bill any charges to the number which appears on the dial of your telephone.
5. This card and number will be valid only during your enrollment at this school.
6. Return this card at the end of the school year or when leaving permanently.

1. The Pager. Also known as the "Beeper" or the "Page Boy," this small, compact device is usually worn unobtrusively on the employee's belt. When headquarters or the supervisor buzzes or beeps him, he simply goes to the nearest telephone and calls in for a message or instructions.

2. The One-Way Radio. This unit allows a transmitter to send a verbal message and a recipient to signal its reception.

3. The Two-Way Walkie-Talkie. Each field unit is also a transmitter which allows a conversation between the dispatcher and the field operator and in some cases between two men in the field. Powerful units can even penetrate cement basements and tunnels.

All these units require a licensed transmitting set. In areas where there is little local traffic, messages can be sent over the Citizens' Band wave length, but heavy traffic will necessitate applying to the Federal Communications Commission for a specified band.

To economize, a small college might start with the pagers and gradually combine them with the more expensive talking units. In addition, it might aim for double use by allowing the buildings and grounds crews to work with the radios on daylight working tours and the security personnel to carry them on night patrols. If the school expands, however, or security problems multiply, the institution might be better served by separate systems for physical plant and police.

FIRE ALARMS

These devices will usually be designed into the wiring capabilities of a building during its planning stage. The more sophisticated systems will have local alarms within the building as well as an annunciator in the main entrance hall to clearly show where in the building the fire originated. All these building alarms should be hooked up with the campus fire departments and security office and also with their local public counterparts.

CLOCK AND BELL

A similar though simpler system also common to most educational buildings is the clock-and-bell system. To synchronize class times accurately and uniformly across campus, physical plant administrators have found it best to tie all clocks and their accompanying warning bells to one central clock-and-control mechanism.

CLOSED-CIRCUIT TELEVISION

The 1960's also brought closed-circuit television to college campuses swamped by tidal-wave enrollments. The initial use, of course, was for transmitting important lectures to a larger audience than could be seated in any auditorium. During the decade many schools also began courses in film and television production, and recently some have begun to use the system to improve campus security. When wired to the campus security station, cameras can provide protective surveillance for rear doors, exposed window areas, loading docks and poorly fenced grounds.

These diverse applications come with problems and a price. All buildings to be served by cameras must be wired with heavy coaxial cables which require careful advance planning to install in new structures and considerable remodeling expense to establish in older buildings. Unless highly skilled electricians are on the physical plant staff, a small college could best handle this kind of project through a private contractor.

MAIL AND MESSAGES

As important to the smooth functioning of a large institution as an efficient administrative staff is a well-managed mail and message system. Important decisions may be reached quickly, but few will be implemented before they are delivered and acknowledged in writing. For such reasons, more than one sage has defined the art of administration as the science of moving paper around speedily--from in-box to out-box, desk to desk, office to office, institution to institution, and back again through the great chain. To speed the paperwork flow, many schools require the physical plant department to provide an in-house mail and message service.

RELATIONSHIP TO THE U.S. POSTAL SERVICE

To a certain degree this service will only supplement that provided by the United States Postal Service, which moves mail across the country, state and county, and delivers and picks up the institution's mail at specified times and places on the campus. At that point the physical plant department must pickup the pouch and route it around the campus along with intracampus messages.

Although a variety of campus methods are currently used, no single pattern will stand scrutiny as the best system for all campuses. Several general principles, however, can help the physical plant director find the best solution to his particular problems.

As always, the first rule is to locate responsibility and authority. At a small school the director either carries the burden himself or assigns it to a single capable supervisor. The second principle calls for the responsible official to work closely with a representative of the local branch of the federal postal service in order to devise together the best pattern for the school.

A major goal is to convince the postal service to perform as much of the delivery work as possible. A morning and afternoon pickup and delivery at specified street addresses is normal procedure. Ideally, the U.S. Postal Service will also deliver student mail directly to the dormitories, where it can be placed in locked mail boxes approved by postal authorities or sorted by a receptionist.

CAMPUS MAILROOM

Even with extensive cooperation from the United States Postal Service, many schools find it helpful to institute their own mail service, and most of those that do will find it indispensible to establish a central mailroom. When the federal delivery spots are too few and the times too inconvenient, the campus mail service can improve efficiency by arranging to pickup the institution's mail itself at the local post office or substation. At the central mailroom, these letters are sorted, combined with intracampus correspondence and delivered to the various academic and administrative departments. On his rounds, the campus mailman picks up both outgoing mail and intracampus messages. A second pickup and delivery usually occurs in the afternoon, followed by a dropoff of all outgoing mail at the post office at the end of the day.

If the local branch of the postal service does not deliver to dormitories, then student mail is also picked up and sorted in the central mailroom. On a small campus, individual lockable boxes might be installed there for resident and nonresident students. This approach also allows the college or university to deliver announcements, notices, grade reports and other official correspondence without the cost and time involved in resorting to the United States Postal Service. On larger campuses, it may be necessary for the campus mailmen to deliver directly to the dormitories for student pickup at a box or reception desk. If they cannot conveniently deliver parcel post to the dormitories, then the mailmen can leave a postcard notifying the student to report to the central mailroom.

DUPLICATING SERVICES

A central mailroom also has other uses. To economize on the expense of numerous office machines, some institutions have set up a central duplicating service in the mailroom. The best available machines operated by a full-time specially trained person should produce cheaper copy, better than that issued from numerous cheaper machines operated occasionally. The same pickup and delivery system used for campus mail could also form the circulation system for the duplicating service. For additional economy, office supplies can be stockpiled in this central station and distributed when needed to the various academic, administrative and staff departments.

TRANSPORTATION AND MOVING

Transportation and moving functions, which often fall within the purview of the physical plant department, can be collected under one division or supervisor or parceled out to several. As an institution grows, it becomes more efficient to centralize these tasks under one group. What follows are the traditional options for transporting faculty, administrators and staff members to branch campuses, off-campus jobs, conferences and the like.

Chapter 10
OTHER FUNCTIONS
Transportation and Moving

TRANSPORTATION PRACTICES

Use of Employees' Vehicles

The common practice at small colleges is for individual departments to reimburse the individual who must drive his own car for necessary off-campus travel. This payment can be based on a weekly, monthly or even an annual payment, but it is most often based on a mileage charge. The form used should account for gas, oil and depreciation. The department budget will be the source of funds under this option.

Leasing Arrangements

Although relatively expensive, leasing can be useful for schools with heavy travel requirements and limited service and repair facilities. This method insures that the school will always have fairly new automobiles to use and will lose no time due to breakdowns and delays in servicing or getting parts. No large capital expenditures are needed to begin such a transportation service. The disadvantages are the high day-to-day cost of operations and the loss of trade-in. Leasing can be both long term and short term with the dealer or manufacturer providing additional vehicles during the peak travel and moving seasons. Many schools with a campus motor pool supplement their fleet in this manner.

Campus Motor Pool

The ideal situation from the point of view of both effective service and economy is a campus motor pool with the facilities to garage, service and repair a wide variety of conventional and specialized vehicles. State-supported and well-endowed private institutions are the only kinds that ever approach this goal. As so often happens in finance, those who have more money are in a position to save more of it through volume buying, centralized operations and reselling. Even small schools, however, often own a few vehicles that the physical plant department has to maintain. Usually a school's fleet begins with the basic pickup, dump trucks, and sedans for the president and selected administrative staff. These may sometimes be purchased from government surplus if the school cannot afford the capital outlay for new machines. As the fleet grows, the following vehicles could be added, not necessarily in this sequence:

1. Sedans. A medium-priced car might be purchased for the president, and low-priced 4-door standard models for administrators, deans, and faculty.

2. Station Wagons. One or two might prove handy for transporting the track team or a purchasing agent looking for materials. One might also serve as an emergency ambulance.

3. Buses. These might transport athletic teams to distant games, carry people between branch campuses, or even shuttle students from outlying dormitories or parking lots. Only frequent use, however, can justify the expense and the specially licensed operators they require.

4. Motor Scooters. These can be 2-wheeled or 3-wheeled, open or enclosed, and can serve the security police, the mail and messenger service, the groundskeepers and the emergency repair crew.

5. Security Police Cruiser. Often this is a 4-door sedan, occasionally a station wagon that doubles as an ambulance.

6. Trucks. The basic pickup and dump trucks were discussed in the Grounds Maintenance chapter under "Grounds Equipment."

7. Specialized Vehicles. Only the largest or most affluent schools can afford airplaines, ambulances, or trash compaction trucks. Smaller schools usually contract with public agencies and commercial services for these needs, and for at least some of the vehicles mentioned earlier.

Automotive Repair

An institution that decides to operate its own motor pool should eventually provide its physical plant department with the money, space and personnel to buy, store, service, repair and resell all the vehicles. A department which operates only one or two cars will find it easier and more economical to ask a local garage service to repair them, but as the fleet grows, the transportation division could slowly take over these jobs by adding one piece of repair equipment for each budget year--a power jack for changing tires, power guns for greasing, hydraulic lifts for major repairs. Although a certain amount of gasoline should be stored on hand for nights, weekends, or emergencies, a gasoline storage tank is one expense that might be long delayed. By the time the division has acquired a large fleet, it should also have assembled a good repair shop staffed with competent mechanics. In the beginning section of this manual, suggestions were given about setting up a central shop with a wing for automotive repairs and storage of key replacement parts. As mentioned there, the mechanics in such a shop will probably work on a variety of other machinery, for example, the tractors and power mowers of the grounds division.

The supervisor of the transportation division should institute a system of programmed maintenance similar to the one discussed in the chapter on Grounds maintenance. He should set up and follow an inspection and maintenance schedule, carefully recording for each vehicle the purchase date and cost, gasoline consumption, miles traveled, oil changes, tire rotations and changes, and repairs. Organized care and recordkeeping enable the school to enjoy optimum use of each car and truck by rectifying deficiencies early and by arranging a trade-in at the opportune moment.

Storage reuqirements depends on climate and local crime conditions. In cold areas garages would be needed, but parking in narrow passageways can often provide sufficient protection. In warm climates, a security fence may be all that is needed, and only if vandalism is a problem.

The Dispatcher

Once all the school's vehicles are assigned to one department, it is essential that one central dispatcher controls their use. He schedules the daily trips and longer journeys, assigns operators where necessary and bills user departments at a rate that covers gas, oil, depreciation, insurance, service, and salaries for mechanics and drivers. When the number of users exceeds the number of cars, he arranges for double use, leases cars or makes them available on a first-come, first-served basis. If administrative committees have established a different travel priority system, he implements it. When moving services are required, he preplans them by scheduling the work in times when the trucks are not slated for normal duties. In many cases he assigns the moving crew. In emergencies of any kind, he is the one man who knows where all the vehicles are and how quickly they can be activated. Without a central control, the scheduling and use of vehicles produces confusion, delay and waste.

Cedar Crest College

ROOM RESERVATION

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Date________________________ No. _____

Group Requesting Reservation:	Building - Room Name or Number:

Date Required:	Type of Event:	Duration of Event:

from______________ am pm to______________ am pm

Hours Space Desired: as above_______ or from______________ am pm to______________ am pm

Remarks/Diagram

Any special equipment or services must be arranged with the agency concerned: Food Service (Mrs. Dorward); Audio-visual (Miss Howard); Buildings and Grounds (Mr. Brown) AT LEAST TWO DAYS NOTICE MUST BE GIVEN FOR SPECIAL EQUIPMENT OR SERVICES.

SPECIAL INFORMATION:

ANY CHANGES OR CANCELLATIONS MUST BE MADE WITH THE COLLEGE CENTER RECEPTIONIST.

Signature of Applicant

Approved by: Date

THIS FORM IS YOUR PROOF OF RESERVATION

Figure 10-2.

427

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SPACE RESERVATION FORM

Date

NOTE: Regulations governing the use of space or other facilities can be found in the "University General and Academic Regulations." Allocation of facilities is administerred by the office of ______________________ This form should be completed five calendar days in advance of the date of the proposed meeting or services desired may not be available.
The University of ________ reserves the right to terminate immediately the privileges for use of facilities of any individual, group, and/or organization which refuses to comply with University regulations, or which permits conduct considered detrimental to the best interest of the University."

NAME OR ORGANIZATION:

SPACE DESIRED: * DATES:

HOURS RESERVED: TO HOURS OF EVENT:
(Time required for set-up & dismantling)

TYPE OF PROGRAM:
(Conference, meeting, dance, social or athletic event, etc.)

GIVE COMPLETE DETAILS ON SUBJECT OF MEETING AND NAME OF GUEST:

ESTIMATED ATTENDANCE: An Admission fee of (will) (will not) be charged.

Program open to (student body) (faculty) (members only) (registrants) (public).

DINING FACILITIES: Yes No HOUSING FACILITIES: Yes No

PHYSICAL PLANT SUPPORT FACILITIES: Yes No ALCOHOLIC BEVERAGES: Yes No

NAME OF APPLICANT: TITLE:

ADDRESS OF APPLICANT: PHONE: Campus

Home

SIGNATURE OF APPLICANT: Date

ENDORSEMENTS FOR AUTHORIZATION

Faculty or Administrative Advisor Date Director of Student Activities Date

***NOTE:** Open flame devices or flammable materials of any nature must not be brought into any building except by special permission of the Department of Public Safety.
Police services and fire guards may be required and the organization will be billed for their services as designated by the Department of Public Safety.

NOTE: FINAL RESERVATION FOR SPACE AND SERVICES IS NOT CONFIRMED UNTIL THE REQUESTING ORGANIZATION RECEIVES A COPY OF THIS FORM.

TOTAL COORDINATION HAS BEEN ACCOMPLISHED. THIS EVENT IS SCHEDULED.

Date

ENDORSEMENTS FOR AVAILABILITY (For Office Use Only)

Date Date

Date

Figure 10-3. Sample Reservation Form for Space and Special Set-ups.

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REQUEST FOR SERVICES

Date ....

SPACE DESIRED: .... DATE OF EVENT: .... HOURS OF EVENT: ....

NAME OF ORGANIZATION: .... HOURS RESERVED: ....

TYPE OF PROGRAM: ....

(Conference, meeting, dance, social or athletic event, etc.)

SIGNATURE OF APPLICANT: .... PHONE: ....

ADDRESS OF APPLICANT: ....

Type of Service	**Description and/or Quantity**	**Estimated Cost**
Sound and Lighting System		$
Craftsman Labor		
Stage or Platforms		
Misc. Properties Desired		
Temporary Seating		
Set-up & Dismantle Labor		
Custodial		
Police		
Fire Marshal or Guards		
Gate Men and/or Ushers		
Utilities, Maintenance & Repair Fee		$

TOTALS $

Send Bill To: ....

Name

Address

Reverse side Figure 10-3.

MOVING SERVICES

Jobs and Crews

This important service is almost always handled by the physical plant department and is best handled when specifically assigned to one of its divisions. The most common moving jobs occur when academic or administrative departments transfer to new or remodeled quarters. Peak moving periods develop because most departments make the shift during holidays to minimize disruption of their operations.

During such chaotic times, a combined transportation and moving division or at least a central dispatcher can be especially effective at minimizing confusion and maximizing service. The primary demands the physical plant department must answer are for trucks and services. Through centralized preplanning a division supervisor or dispatcher can schedule the right trucks and assemble enough men to complete all the jobs before the students or office workers return.

Where transportation and moving are not combined, the workmen may come from whichever physical plant division has a light workload at the time of the move; most often they would come from the custodial force and grounds crew. Even in departments that combine transportation and moving, additional men may be shifted from these other divisions to help during busy moving sessions.

Another frequent moving task is the delivery of new equipment. For inventory control, most universities have a central receiving station where manufacturers deliver file cabinets, furniture, tools, typewriters and other products. It is the dispatcher who arranges for final delivery to the using department by scheduling the project into free time of the men and machines under his control.

Special Events

Moving crews can also handle the numerous special events that dot the school calendar. The work could include preparing a stadium for football games and track meets, decorating a dance hall, and setting up and dismantling stages and chairs for special lectures, convocations, rock concerts and commencements. Because such events are so large and occur so irregularly, the transportation and moving crews would have to be supplemented with men from other divisions, with students or with part-time help. The preceding Figure 10-2 and 10-3 are samples of space reservation forms.

SOLID WASTE DISPOSAL

PUBLIC OR PRIVATE CONTRACTS

When a physical plant department manages this service, it often relegates this additional job to the division charged with transportation and moving. Because of the complex regulations involved and the specialized equipment required, small schools would do well to arrange for public or commercial services to handle this task--at least until the physical plant department grows large enough to absorb this function at a saving. Many cities provide this service free or at a nominal fee. The only work required of the plant department may be separation of the types of waste and removal to the curb for a scheduled pickup. A private contractor charges more and requires similar labor, but under a carefully negotiated contract he can usually save the small college considerable outlay for equipment and labor.

IN-HOUSE SERVICE

If the physical plant director decides at some point that his department can handle this job more economically, he should first examine closely the complicated regulations governing environmental protection that are emerging from each new legislative session at the city, county, state and federal levels. Although the primary source of regulations, of course, is the federal Environmental Protection Agency, other bodies also are passing new and sometimes conflicting laws at a rate that requires the director or a delegated supervisor to pay constant attention to new legislation to insure the school complies properly.

Equipment

The basic elements of this job are collecting, compacting and removing trash, rubbish and junk--all the waste that the sewage system cannot carry. Public and private services try to combine these jobs into one operation by using specially designed trucks which pickup, compact and drive straight to the landfill when full. A college that cannot afford to buy and maintain such a machine can use any of their standard pickup and dump trucks, to collect the trash and deliver it to one central trash compacting station. Given the high cost of frequent trips to an off-campus landfill or incinerator, intense compacting at a central station is essential to an economical operation. Specialized labor will not be needed in the solid waste disposal program, but specialized equipment like the following may be:

> *Incinerators*. An old standby for reducing the amount of trash to be hauled away from the campus; older models of this device have nearly been shut down by restrictions on stack emissions, however, a high temperature incinerator with refined controls might still prove useful if the volume of waste to be reduced is quite large.
>
> *Compactors*. These come in many sizes, ranging from small roll-arounds for use in cafeterias to hydraulic units that put out cubes weighing thousands of pounds.
>
> *Pulpers*. These machines grind up paper, garbage and nearly anything else except heavy plastic and large cloth items. Because they can reduce volume by 85% in many cases, pulpers eliminate many unnecessary trips to the landfill.
>
> *Balers*. Another familiar standby in industries with predominately paper rubbish, these can be relatively expensive for college use since they require a sorting operation with high labor cost rate.

Special Problems

Although enthusiasm for ecology has spurred interest in recycling paper, glass and metal, such programs are as yet difficult to administer economically. The lack of technology for sorting these materials means expensive hand operations that can completely consume any monetary return. Where volunteers are willing to sort without pay, physical plant personnel should cooperate with and supervise such programs, and thereby reduce the waste to be hauled and help conserve dwindling natural resources.

Where to dispose of waste is another worsening problem. Many landfills are closing down due to problems such as lack of space, improper operation, bothersome odors and vermin. Few schools can now operate on-campus landfills and most of those that own usable landfills have to carry the heavy cost of long-distance transportation. As a result, many schools that run their own trash collection and compaction utilize privately operated landfills for final disposition of the waste.

Some words of caution to close this discussion. By accepting gracefully the kinds of jobs discussed in this chapter and by managing them skillfully, the physical plant director can serve the cause of education, and in the process build substantial support within his institution. He can also overextend himself and his department, and this is likely to happen even in the best organizations. At least one poet argues that you can never know what is enough until you know what is too much, and countless historians warn that most empires overexpand, decline and fall. The wise administrator, therefore, will expect a day when his ambitions will overreach the capabilities of his department.

By recognizing this day when it arrives, the director contributes to, rather than detracts from, the educational process he serves. If he has done his homework well during the formative stages, auxiliary services should--barring gross mismanagement--function better as autonomous operations. At small schools, of course, the director and his men will always "wear several hats." As a general principle, the time to take one off is when it becomes too heavy to wear with head held high.

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